SANYO

FILE No.

Service Manual

CO_2 Incubator
MCO-5AC

SM9910037

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Effective models

This service manual is effective following models.

Model name	Model code	Voltage and Frequency	
MCO-5AC	823 282 51	110-120V	60Hz
	823 282 52	220V	50Hz
	823 282 53	220V	60Hz
	823 282 54	220-240V	50Hz

Features

1. Easy operation & smaller installation space
   - This small sized cabinet can be stacked. (548mm of its depth)
   - Usable height (only 1704mm height) even if stacked 3 units.
   - Selectable right or left-hand door.
     (Please consult with your service representative.)
   - Air-jacket type is suitable for the maintenance.
   - Control panel is fitted on the outer door surface and it has a wide digital display and a large keypad.
   - Inside chamber wall made by stainless steel and its corner made rounded type, cleaning easier.

2. Internal temperature & internal humidity recovery characteristics
   - Original Direct Heat & Air (DHA) jacket system

3. Anti-bacteria SUS
   - Inside chamber (except for humidifying pan) material is made by anti-bacteria SUS.

4. A new ROM installed
   - A new ROM version installed to set Communication system optionally.

5. Validation
   - Display Zero Adjustment and Span Adjustment can be operated on the control panel.

Note ; Model name

M CO – 5 A C

- C: Copper alloy anti-bacteria stainless steel
- A: Air jacket
- 5: Chamber capacity (50L)
- CO: CO_2 Incubator
- M: Medical equipment

Structural specification

Name	CO_2 incubator
Model	MCO-5AC
External dimensions	W 480 x D 548 x H 568 (mm)
Internal dimensions	W 350 x D 378 x H 375 (mm)
Interior volume	49 L
Exterior	Acrylic finish baked on zinc galvanized steel
Interior	Stainless steel containing copper
Door insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Outer door	Acrylic finish baked on zinc galvanized steel, Reversible support (selectable right or left-hand door)
Inner door	Tempered glass (reversible, thickness 5mm)
Tray	Stainless steel containing copper 3 trays (maximum 6 trays) available W310 x D310 x H12 (mm), Maximum load: 4kg/tray
Access port	ϕ30mm x 1, right hand on the back
Accessories	Power supply cord, 3 trays, 1 gas tube, 1 humidifying pan, Stacking plate A & B, 4 protective stickers, 2 tube bands
Weight	49 kg
Optional accessory	Self-contained CO_2 cylinder changeover system (MCO-5GC) Extra tray (MCO-30ST), UV system kit (MCO-18UVS2), Roller base (MCO-5RB)

Parts for Antibacterial stainless:

- Inner cabinet
- Trays
- Tray support (right & left)
- Duct
- Humidifying pan cover

※The humidifying pan is not made of copper alloyed stainless steel.

Performance specification

Model	MCO-5AC
Usable environment condition	Temperature: ＋5℃～＋35℃ Humidity: equal or less than 80%R.H. (When an ambient temperature is equal or lower than ＋15℃, the desired performance may not be obtained)
Temperature control range	Ambient temperature＋5℃～＋50℃ （Settable range:0℃～＋50℃）
Temperature distribution	±0.25℃ ※ (ambient temperature:＋25℃, setting:＋37℃, CO_2:5%, no load)
Temperature variation	±0.1℃ ※ (ambient temperature:＋25℃, setting:＋37℃, CO_2:5%, no load)
CO_2 control range	0～20%
CO_2 variation	±0.15% (ambient temperature:＋25℃, setting:＋37℃, CO_2:5%, no load)
Chamber humidity	95±5%RH
Internal humidity recovery period	30 minutes or less（until the internal humidity is recovered to 90%RH after door opened for 30 seconds.）
CO_2 inlet pressure	0.03 MPaG（0.3kgf/cm^2G）
Power supply	Single phase, local voltage
Maximum power consumption	205 W
Total maximum current	110-120VAC: Maximum 1.8 A 220-240VAC: Maximum 0.9 A
Maximum heat emission	740 kJ/h

Test condition:

Set point:＋37℃
CO_2 set point:5.0%
No load
Ambient temperature:＋25℃
Ambient humidity:Approx.45%

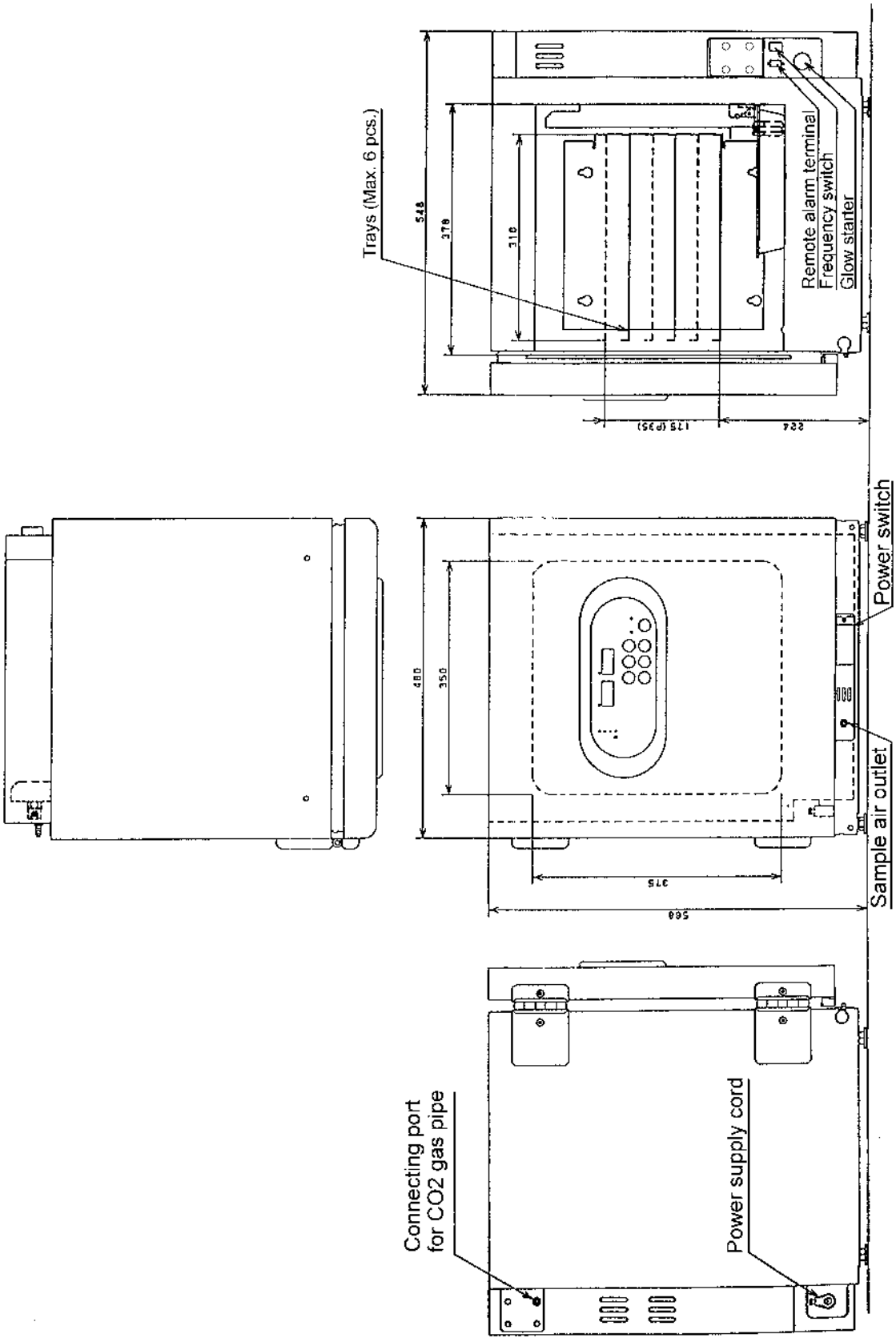
※ Based on the measuring method on validation service manual.

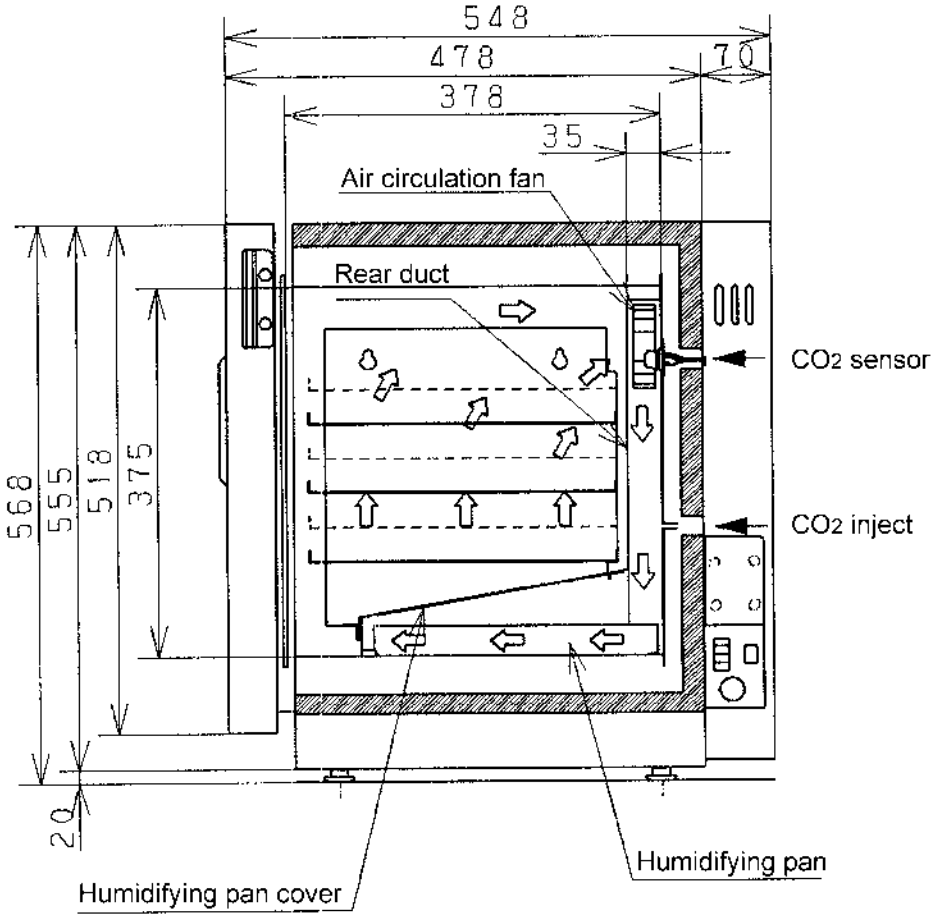
Control specification

Model	MCO-5AC
Heating method	Direct Heat & Air Jacket (DHA)
Temperature control system	Microprocessor PID Sensor：Temperature sensor（103AT-1） Directly detect and control
Temperature indication	Digital display (resolution: 0.1℃)
CO_2 measuring system	TC sensor
CO_2 level indication	Digital display (resolution: 0.1%)
Humidifying system	Natural evaporation with humidifying pan
Air circulation	Breeze circulation
Alarm	High/low temperature alarm, CO_2 density alarm, Door alarm, Upper limit temperature alarm, Water level alarm
Remote alarm	When an alarm is triggered: Remote alarm ON（Alarm interlocks with buzzer） Contact output：rating of contact 30VDC, 2A
Self diagnosis function	Error code and internal temperature are alternately displayed Buzzer and remote alarm contact ON
UV lamp control *	Automatic ON-OFF control (changeable with Function mode) 1. Interlock with door: UV lamp lights for setting period after door is open and shut. 2. OFF mode: UV lamp does not light.

* UV lamp is an optional accessory.

Dimensions


Trays (Max. 6 pcs.)
548
370
310
Remote alarm terminal
Frequency switch
Glow starter
175 (P35)
224
480
350
375
560
Power switch
Sample air outlet
Connecting port
for CO2 gas pipe
Power supply cord


548
478
70
378
35
Air circulation fan
Rear duct
CO2 sensor
CO2 inject
568
555
518
375
20
Humidifying pan cover
Humidifying pan

Electrical parts

MCO-5AC		AC110-120V, 60Hz	AC220v, 50Hz	AC220-240v, 50Hz
CO_2 sensor	Type	HS-3C-S3	HS-3C-S3	HS-3C-S3
	Code	MIR-1000CO2	MIR-1000CO2	MIR-1000CO2
Temp. sensor	Type	103AT-1	103AT-1	103AT-1
	Rating	10KΩ(25℃)	10KΩ(25℃)	10KΩ(25℃)
Overheat protect sensor	Type	103AT-1	103AT-1	103AT-1
	Rating	10KΩ(25℃)	10KΩ(25℃)	10KΩ(25℃)
Fan motor	Type	FL2-011Y1M	FL2-011Y5M	FL2-011Y5M
	Rating	110-115VAC	220-240V	220-240V
Transformer for PCB	Type	ATR-HN231UT	ATR-HN235T	ATR-HN235T
	Primary	115V	230V	230V
	Secondary	8.5VAC ±18VAC	8.5VAC ±18VAC	8.5VAC ±18VAC
Top heater	Rating	115V 4.5W	230V 4.5W	230V 4.5W
		2939Ω	11755.6Ω	11755.6Ω
Back heater	Rating	115V 16W	230V 16W	230V 16W
		827Ω	3306.3Ω	3306.3Ω
Side heater	Rating	115V 15W	230V 15W	230V 15W
		882Ω	3526.7Ω	3526.7Ω
Flange heater	Rating	115V 20W	230V 20W	230V 20W
		661Ω	2645Ω	2645Ω
Bottom heater, front	Rating	115V 2.5W	230V 2.5W	230V 2.5W
		5290Ω	21160Ω	21160Ω
Bottom heater, back	Rating	115V 3.4W	230V 3.4W	230V 3.4W
		3890Ω	15558.8Ω	15558.8Ω
Bottom side heater	Rating	115V 10W	230V 10W	230V 10W
		1323Ω	5290Ω	5290Ω
Front panel heater	Rating	115V 18W	230V 18W	230V 18W
		735Ω	2938.9Ω	2938.9Ω
Door heater	Rating	115V 60W	230V 60W	230V 60W
		220Ω	881.7Ω	881.7Ω
Bottom front sub heater	Rating	115V 5W	230V 5W	230V 5W
		2645Ω	10580Ω	10580Ω
Hinge sub heater, right	Rating	36V 0.3W	36V 0.3W	36V 0.3W
		4320Ω	4320Ω	4320Ω
Hinge sub heater, left	Rating	36V 0.3W	36V 0.3W	36V 0.3W
		4320Ω	4320Ω	4320Ω
Bimetal thermo	Type	TH-2U	TH-2U	TH-2U
	Rating	60℃ ON, 70℃ OFF	60℃ ON, 70℃ OFF	60℃ ON, 70℃ OFF
Solenoid valve	Type	FAB11-X1528	FAB11-X1528	FAB11-X1528
	Rating	DC24V	DC24V	DC24V
Noise filter	Type	ZUG2210-11	ZUG2210-11	ZUG2210-11
	Rating	250VAC 10A	250VAC 10A	250VAC 10A
Power switch	Type	BAM210171	BAM210171	BAM210131
	Rating	250VAC 10A	250VAC 10A	250VAC 10A
Door switch	Type	SS160-A15	SS160-A15	SS160-A15
	Rating	28V 50mA	28V 50mA	28V 50mA
DC 5V power supply	Type	ZWS15-5/J	ZWS15-5/J	ZWS15-5/J
	Primary	5VDC 3A	5VDC 3A	5VDC 3A
	Secondary	85-265VAC	85-265VAC	85-265VAC
Water sensor	Type	OLS-1003S	OLS-1003S	OLS-1003S
	Rating	DC5V	DC5V	DC5V
UV lamp *	Type	GL4	GL4	GL4
	Rating	4W	4W	4W
Glow starter *	Type	FG-7P	FG-7P	FG-7P
Ballast *	Rating	115V, 60Hz	220V, 60Hz	230V, 50Hz

* Optional parts.

Temperature calibration

Note) When Key Lock is ON, calibration mode is disabled.

(1) Press [CAL] key for approx. 5 seconds.

(2) The top (the 3rd) digit of temperature display is flashing, other digits will go off.

(3) Set the present correct temperature with ▶▶ key and ▲ key. Press [ENT] key.

(4) The display will automatically revert to the present temperature.

〔Example〕 If the internal temperature display shows 37.0℃(the set value)and the actual measured value is 36.8℃,

① Press [CAL] key for approx. 5 seconds.

② The "3" (top digit) of temperature display is flashing, other digits will go off.

③ Set the displayed value at 36.8℃ with ▶▶ key and ▲ key, then press [ENT] key.

④ The display will automatically revert to the present temperature.

(Note)

- In temperature calibration, it is important to accurately measure the internal temperature. Particularly, for the thermometer used, its grade of accuracy should be than 0.5 class. The measure should be carried out at the center of the chamber.

- The temperature calibration range is between the set value ±1.0℃. If the value over this range is input, an error tone will be emitted, the input data will be ignored, and the display will revert to the present temperature. Therefore, if you need to calibrate more than 1.0℃, you should repeat above procedure several times.

Notes when the unit installation

The displayed internal CO_2 is higher than the actual when the internal temperature and humidity are not stabled (reached) just after the unit started running.
It is not abnormal because the CO_2 sensor is heat conducting type.

After the internal temperature is set to desired value and CO_2 is set to 0%, pour 1.5L distilled water into the humidifying pan then run the unit for approx. 8hours to be internal temperature and humidity stabled.
Finally perform CO_2 zero setting and CO_2 span setting.
(See Service Manual for details.)

CO_2 Calibration

Note) When Key Lock is ON, calibration mode is disabled.

（1） Press [CAL] key for approx. 5 seconds.

（2） The top (the 3rd) digit of temperature display is flashing, other digits will go off.

（3） Press [CAL] key again.

（4） The top (the 3rd) digit of CO_2 density display is flashing, other digit will go off.

（5） Set the present correct CO_2 density with [▶▶] key and [▲] key. Press [ENT] key.

（6） The display will automatically revert to the present temperature.

〔Example〕 If the internal CO_2 density display shows 5.0%（the set value）、the actual measured value is 4.5,

① Press [CAL] key for approx. 5 seconds.

② The top digit of temperature display is flashing, and other digits will go off.

③ Press [CAL] key again.

④ The top digit of CO_2 density display is flashing, other digits will go off.

⑤ Set the displayed value at 4.5% of the actual measured value with [▶▶] key and [▲] key, then press [ENT] key.

⑥ The display will automatically revert to the present temperature.

（Note）

- In CO_2 calibration, if CO_2 density display is less than 2.0%, an error tone will be emitted and the input data will be ignored, and the display will revert to the present temperature.
- CO_2 calibration should be done after CO_2 density measuring was done at least 3 times after checked that there is no error of measurement.
- CO_2 should be injected less than 0.2L/min in CO_2 density meter.
- Internal humidity should be 80% or more in order to remove the difference between actual CO_2 density and display density. CO_2 should be measured after 30 minutes passed since the door open-and-shut.
- CO_2 calibration should be done in consideration of the difference for CO_2 density meter.

CO_2 zero adjustment

Note) When Key Lock is ON, zero adjustment is disabled.

(1) Make sure there is not CO_2 left. Press [CAL] key twice and set CO_2 value to “00.0”. Press [ENT] key to come CO_2 zero adjustment to end.

Control specifications

1. Key and switch

BUZZER: When an alarm LED is flashing and the buzzer sounds,
Buzzer and remote alarm output ⟶ Force to turn off
When an alarm lamp flashing and the buzzer does not sound, buzzer remains OFF.

SET : Press the key once to enter the device into setting mode.
Press it twice to enter the device into CO_2 level setting mode.
Press three times to enter the device into over-heat protection temperature check mode. Press four times to revert the device to internal temperature (PV) display.

▶▶ : In setting mode, the device can be shifted the 2nd digit ⟺ the 1st digit ⟺ the 1st decimal place.
In PV display, press the key pressing 5 seconds or more to enter the key lock mode.

▲ : In the setting mode, the blinking digit counts up.

CAL : In PV display, keep the key pressing approximately 5 seconds to enter the device into the calibration mode, press again to enter the device into the CO_2 calibration mode. When the CO_2 setting value (SV) is 0%, the device goes into PV display instead of the CO_2 calibration mode.
In the temperature calibration mode, input F×× with ▲ key and then press ENT key to enter the device into the function mode to obtain information of each mode.

ENT : During setting mode, CAL mode and Function mode, press the key to store the value. The function is not valid for the unchangeable values.

A／B : The lamp is available only in Auto-changer mode (option) in F08.
In Auto-changer mode, press the key to switch the cylinder in use to another one.
Lighting A or B indicates as the cylinder in current use. (If the Auto-changer mode is not installed, the cylinder switcher lamp does not activate)
When the cylinder in use is emptied, automatically switches to another one. At the time the lamp of cylinder emptied will blink, and the lamp of another one will be lit.
(Ex: When the CO_2 cylinder in current used is emptied, the lamp cylinder A switches to blink, and then the lamp cylinder B will be lit.)

2. Temperature control

Setting range : 0℃～＋50℃
Display range : 0℃～＋99.9℃
Setting method : Press the SET key. Change to the desired value with ▲ key and ▶▶ key, then press the ENT key. The value will be stored and then the device shifts to CO_2 setting mode.

Out of setting range: When a value is set out of the range and ENT key is pressed, buzzer sounds 1 second (continuously) and the previous setting is still remained.

Control : PID control

Alarm : When the PV is higher than SV±1℃, the display digit blinks.
After 15minutes later, buzzer sounds and remote output turns ON.

3. CO_2 control

Setting range : 0%~20%
Display range : 0%~99.9%
Setting method : Press SET key twice.
Change to the desired CO_2 level with ⏫ key and ⏩ key, then press ENT key to store the value. Then the device shifts to the Overheat protection temperature check mode.

Out of setting range: When a value is set out of the range and ENT key is pressed, buzzer sounds 1 second (continuously) and the previous setting is still remained.

Control : ON-OFF method. Intermittent controls to prevent overshooting:
PV＜(SV-2%) : continuously ON
(SV-2%)≦PV＜(SV-0.6%) : electrifying ratio is 60%
(SV-0.6%)≦PV＜(SV-0.02%) : electrifying ratio is 21%
PV≧(SV-0.02%) : OFF
PV=SV-2% : forcibly OFF approximately 15 seconds
Forcibly OFF for 1 minute after reset

Control OFF : When a value is set in 0.0%, CO_2 display will be disappeared to be "Control OFF".

Alarm : When the internal CO_2 level deviates higher than SV±1%, CO_2 display blinks. After the 15mininutes later, buzzer sounds and remote alarm terminal turns ON.

4. Overheat protection temperature check mode

Setting range : ＋35℃～＋51℃

Setting method : Press SET key for three times to display the overheat protection temperature on PV display and "HI" on CO_2 display.
Press SET key again to revert to PV display.

5. Alarm, safety mode and self diagnosis function

In sensors malfunctions and CO_2 control malfunctions, an error code and PV is displayed alternately.
Note) The remote alarm is controlled in every a minute exceptionally in Auto Zero.
That's why the remote alarm control is delayed 4minutes (max) after an error is displayed.
<Error code>

E01: CO_2 cylinder is empty
E05: Temp. sensor is open circuit
E06: Temp. sensor is short circuit
E09: Ambient temperature sensor is open circuit
E10: Ambient temperature sensor is short circuit
E11: CO_2 sensor output voltage is abnormal
E12: Main heater is abnormal
E13: Bottom heater is abnormal
E14: Door heater is abnormal
E16: SSR for each heater is open circuit
E18: UV lamp malfunction (a lamp blown out, a glow lamp unfitted, etc)

The description of error codes are follow:

E01 : CO_2 cylinder is empty
When the CO_2 level does not go up 0.2% or more in a minute even though the valve is opened (including in intermittent controlled), “E01” and “Internal temperature “ are displayed alternately, and buzzer sounds intermittently.
The definite action that CO_2 cylinder is empty, repeats twice, therefore it takes approximately 2minutes to display an error after the cylinder would be emptied.

E05,E06 : Temp. sensor malfunction (open / short circuit)
When the micro-computer detects an internal temperature as 0℃ or lower, it is judged as “open circuit” displaying alternately “E05” with PV and sounding intermittent buzzer.
When the micro-computer detects an internal temperature as +60℃ or higher, it is judged as “short circuit” displaying alternately “E06” with PV and sounding intermittent buzzer.
Note) In E05 and E06, displayed PV is different from apparatus actual temperature)

E09, E10: Ambient temperature sensor malfunction (open / short circuit)
When the micro-computer detects an ambient temperature as 0℃or lower, it is judged as “open circuit” displaying alternately “E09” with PV and sounding intermittent buzzer.
When the micro-computer detects an ambient temperature as +60℃or higher, it is judged as “short circuit” displaying alternately “E10” with PV and sounding intermittent buzzer.

E11 : CO_2 sensor output voltage is abnormal
When A/D input voltage in CO_2 sensor is more than 4800mV, CO_2 sensor is abnormal. “E11” and internal temperature are displayed alternately, buzzer sounds intermittently. At the time CO_2 valve is “closed”.

E12 : Main heater is abnormal
When high temperature alarm is activated, when the main heater is open circuit, and when the main heater SSR is short circuit, “E12” and an internal temperature are displayed alternately and buzzer sounds intermittently. An error is not displayed just after failed because SSR and heater failure is self-diagnosed in every 40min or in the power supplied.

E13 : Bottom heater is abnormal
When the bottom heater is open circuit, or SSR is short circuit, “E13” and an internal temperature are displayed alternately, and buzzer sounds intermittently.
An error is not displayed just after failed because SSR and heater failure is self-diagnosed in every 40min or in the power supplied.

E14 : Door heater is abnormal
When the door heater is open circuit, or SSR is short circuit, “E14” and an internal temperature are displayed alternately, and buzzer sounds intermittently.
An error is not displayed just after failed because SSR and heater failure is self-diagnosed in every 40min or in the power supplied.

E16 : SSR is open circuit
When any SSR of main heater, bottom heater, door heater and CO_2 sensor box heater is open circuit, “E16” and an internal temperature are displayed alternately, and buzzer sounds intermittently.
An error is not displayed just after failed because SSR and heater failure is self-diagnosed in every 40min or in the power supplied.

E18 : UV lamp malfunction (UV lamp is optionally provided)
When the UV lamp lighting time (F01) is set, the microcomputer checks the output voltage in UV detect circuit for 5seconds of 25~29seconds after the door was open and shut. If the voltage is higher than 0.2V, it counts as “+” and counts as”-“ if lower. After 30seconds has passed then, the microcomputer checks the voltage again. It is judged as “UV lamp operative” if the value comes to “+” and judged as “UV lamp malfunction” if the value comes to “-“. At the time “E18” and “internal temperature “ are displayed alternately with the buzzer sounds intermittently. Press BZ key to cancel the error.
When the door is open before the microcomputer checks the output voltage, it does not perform UV lamp checks.

Upper limit temperature alarm:
When the internal temperature deviates from upper limit temperature alarm SV, OVERHEAT lamp is lit displaying “PV” with “E12” (main heater malfunction) or “E16” (SSR for each heater is open circuit) alternately. The buzzer sounds intermittently. It is impossible to stop the buzzer sounding by BUZZER key.
At the time heaters (main heater, bottom heater and door heater) will be OFF.

Automatic set temperature alarm
When the internal temperature deviates from SV±1.0℃, all digits in temperature display blink and intermittent buzzer sounds with 15minutes delay.

Automatic set CO_2 density alarm
When the internal CO_2 density deviates from SV＋1.0%, all digits in CO_2 display blink and intermittent buzzer sounds with 15minutes delay.

Automatic UV lamp lighting
When the door is closed for 12hours, UV lamp will be lit to sterilize for specified period that is set in F01.

6. Key lock function

Lock mode : In PV display, keep pressing ▶▶ key (shift key) over 5 seconds to enter key lock mode, display will change to “L0”.
Press ▲ key to set 1 …… Key lock ON
Press ▲ key to set 0 …… Key lock OFF
Press SET to memorize the set, then automatically returns to PV display.

Note) In Key Lock ON, the device can enter into SET mode to check SV, however, the value cannot be changed. The device also cannot enter into Function mode.

7. Door alarm

Indication : When the door is opened, DOOR lamp is lit.
When the door is closed, DOOR lamp goes off.

Safety operation : When the door is opened, fan motor turns off, CO_2 valve shuts off, (UV lamp turns off if it is optionally fitted).
If the door left opened for 60seconds, the heater turns off.

8. Auto return

Function : In setting mode, Key Lock mode and Function mode, if any key is not operated for 90 seconds or more, the display automatically reverts to PV without storing the value to be changed.

9. Calibration

Temperature calibration : In PV display, press CAL key for approx. 5seconds to enter the device into temperature calibration mode.
Input a proper value with ▲ key and ▶▶ key then press ENT key to store the value. Finally the device reverts to PV display.

CO_2 calibration : In PV display, press CAL key for approx. 5seconds to enter the device into temperature calibration mode, then press CAL key again to enter the device into CO_2 calibration mode.
Input a proper value with ▲ key and ▶▶ key then press ENT key to recognize and store a span calibrated value. Finally the device reverts to PV display. (a span adjustment)
If CO_2 level is lower than 0.9% or higher than 20% on the display, or if a value to calibrate is higher than 2.0%, the buzzer beeps to cancel the data input then automatically reverts to PV display.

10. Function mode

F00: Simply pass through.
F01: UV lamp lighting time set (initial: 000)
(*UV lamp is optionally provided)*
F02: UV lamp 24hours sterilization mode set
(*UV lamp is optionally provided)*
F03: Service code input (code: 384)
F04: UV lamp life span check
(*UV lamp is optionally provided)*
F05: CO_2 sensor voltage is displayed
F06: Bottom heater output ratio set (initial: 5)
F07: Door heater output ratio set (initial: 6)
F08: Auto changer set and DEMO mode set (initial : 000)
F10: A coefficient for CO_2 zero point adjustment value is displayed
F11: A coefficient for CO_2 span point adjustment value is displayed
F12: Ambient temperature sensor temperature is displayed
F13: Non-volatile memory initialization
F14: LEDs and drivers performance check
F15: Temperature zero point adjustment value is displayed (initial: 008)
F21: Communication device address (ID) set (initial: 000)
F22: Communication parameter set (initial: 000)
F24: Remote alarm interlocks with buzzer (initial: 000)
F25: Ring Back time set (initial: 030)
F30: A ROM version is displayed

Direction for use: In PV display, press CAL key for 5seconds or more to enter the device into temperature calibration mode. Input a desired function code with ▲ key and ▶▶ key then press ENT key.

F01: UV lamp lighting time set. (initial: 0min, setting range:0~30min)
Note) UV lamp is optionally provided.

<Direction for use> Input “F01” on the temperature display then press ENT key to show a present SV on the CO_2 display. Input the desired value with ▲ key and ▶▶ key then press ENT key to store the value and automatically reverts to PV.
If a value out of the range is input then ENT key is pressed, the buzzer sounds continuously for 1 second to save the previous setting.

<Action> After the door is opened and shut, UV lamp is lit in appointed time then automatically goes off. There is approx. 3~5seconds delay to active the mode, due the water level sensor would check water level in the humidifying pan just after the door shut. The lamp goes off if the door is opened while UV lamp is lit.

F02: UV lamp 24hours sterilization mode set
Note) UV lamp is optionally provided.

<Direction for use> Input “F02” on temperature display to show “000” on CO_2 display.
Input “001” with ⏫ key and ⏩ key to enter the device into 24hours sterilization mode. Press ENT key displaying “000” to automatically revert to PV display.

<Action> UV lamp is lit once 24hours sterilization mode was set and automatically goes off after 24hours has passed. In the middle of 24hours sterilization, UV lamp goes off if the door is open and 24hours sterilization mode would be cancelled.
If 24hours sterilization mode is reset in the middle, it would start 24hours sterilization mode from the beginning.

Note) UV indicator lamp should light once 24hours sterilization mode is set if UV lamp is unfitted.

F03: Service code input (code:384)
Note that those who know service code (384) should use F04 or the following functions (except for F21, 22, 24, 25 and 30).

<Direction for use> Input the code ”384” to use the following functions.
Input “F03” on temperature display then press ENT key to show “000” on CO_2 display. (“384” is shown if service code has been already input)
Input service code “384” with ⏫ key and ⏩ key, and press ENT key to revert to PV display. Now F04 and the following functions are available.
If F03 or a following function code is input without inputting the code “384” in F03 (ex. if “F05” is input then ENT key is pressed), the continuous buzzer sounds for 1 second to revert to PV display.

Note) The code “384” is saved unless “000” is input in F03 or the mains is OFF.

F04: UV lamp life span check
Note) UV lamp is optionally provided.

<Direction for use> Input “F04” on temperature display and press ENT key to show the UV lamp consumed time by %.

<Description> The microcomputer calculates UV lamp whole life span as 1000hours.
The 1000hours is considered as “1”. UV lamp consumed time is displayed by %.
For example, the period less than 5minutes is considered as 5minutes, the period of 6~30minutes is simply counted as they are.
In 24hours mode, simply 24hours is added just after “001” is input and ENT key is pressed in F02, ignored with the cancel for 24hours mode caused by the door is opened in the middle.
The added time is stored in the non-volatile memory in every 24hours.
Display the added time in F04 then display “000” on CO_2 display with ⏫ key and ⏩ key and press ENT key to clear the value.
The display range is 0~260%. A value over than 260% is not added.
If the added time is over than 1000hours, UV indicator on the control panel flashes to inform “UV lamp run down”. The “run down” is provided by the microcomputer’s calculation, it does not mean “the actual time to be UV lamp run down”.

UV lamp consumed time	UV indicator operation	
	During UV lamp ON	During UV lamp OFF
1000hours or less	Lit	Goes off
1000hours or more	Lit	Flashes

F05: CO_2 sensor voltage is displayed
(A/D converter voltage in microcomputer on the main PCB)
<Direction for use> Input “F05” on temperature display and press ENT key to show the voltage in CO_2 sensor on CO_2 display. Since the 90seconds Auto Return is invalid in this mode, press ENT key to come to the end. In F05 displayed, CO_2 is not injected.

F06: Internal humidity adjustment by changing the electrifying ratio to the bottom heater. (initial: 5, setting range: 0~29)
<Direction for use> Input “F06” on temperature display and press ENT key to show a current SV on CO_2 display.
Sum the value up to make humidity higher. Lessen the value to make humidity lower.
Press ENT key to store the value and automatically reverts to PV display.

F07: Dew condensation prevention by changing the electrifying ratio in the door heater. (initial: 6, setting range: 0~9)
<Direction for use> Input “F07” on temperature display and press ENT key to show a current SV on CO_2 display. If there is dew condensation on the door, sum the value on CO_2 display up and press ENT key to store the value and automatically reverts to PV.

F08: Auto Changer ON/OFF set, Demonstration mode set (initial: 000)
In Auto Changer mode, both of CO_2 cylinders are available when CO_2 is requested to supply. A lamp of cylinder in current used (either lamp-A or lamp-B) is lit to switch manually one to another with A/B key.
If the cylinder in current used is empty, automatically switches to another cylinder and the lamp of empty cylinder flashes.
<Direction for use> Input “F08” on temperature display and press ENT key to show a current SV in the 3^{rd} digit on CO_2 display. The value “0” is the normal mode (Auto Changer is inoperative), the value “1” means Auto Changer is operative.

F10: A coefficient for CO_2 zero point adjustment value is displayed (initial: 000)
<Direction for use> Input “F10” on temperature display and press ENT key to display a coefficient for CO_2 zero point adjustment value on CO_2 display. If you press ENT key or leave it for 90seconds, automatically reverts to PV display.
<Description> The previous zero point value is added to the PV in zero point adjustment. The sum is stored as the zero point adjustment value.
e.g. When zero adjustment is performed in PV 1.3%, zero adjustment value should be –1.3%. At the time “-13” is displayed in F10.

F11: A coefficient for CO_2 span point adjustment value (initial: 100)
<Direction for use> Input “F11” on temperature display and press ENT key to display an adjustment value for CO_2 zero point on CO_2 display. If you press ENT key or leave it for 90seconds, automatically reverts to PV display.
<Description> The adjustment value is used for CO_2 calibration.
e.g. When the CO_2 display is 5.0% in actual CO_2 density is 4.5%, if the CO_2 calibration is set in 4.5%, the value of F11 should be “90”.
Calculation: 4.5/5.0 × 100 = 90

F12: Ambient temperature sensor temperature is displayed.
<Direction for use> Input “F12” on temperature display and press ENT key to display an ambient temperature sensor temperature on CO_2 display. If you press ENT key or leave it for 90seconds, automatically reverts to PV display.
Note) This temperature is not synchronized with actual ambient temperature since it is affected by waste heat in electrical parts. (approximately 5℃ higher than the actual temperature)

F13: Non-volatile memory initialization (initial: 000)

This function should be used only when data in the non-volatile memory cannot be restored owing to unexpected events (ex: noise).

Do not use in normal condition.

<Direction for use> Input “F13” on temperature display and press ENT key to display “000” on CO_2 display, then change the 1st digit to “1” and press ENT key to initialize all the data in non-volatile memory.

Followings are each initial values in non-volatile memory:

Internal temperature SV	: 37.0℃
CO_2 level SV	: 0.0%
Humidifying heater balance value (F06)	: 5
Door heater balance value (F07)	: 5
CO_2 zero adjustment data (F10)	: 000
CO_2 span data (F11)	: 100
Internal temperature zero adjustment data (F15)	: 008
Key Lock data	: Key Lock OFF
Auto Changer data (the 3rd digit in F08)	: Auto Changer OFF
Demo Mode data (the 2nd digit in F08)	: Demo Mode OFF

Input “F13” on temperature display and press ENT key to display “000” on CO_2 display, then change the 1st digit to “2” and press ENT key to initialize CO_2 zero adjustment data and CO_2 span data in non-volatile memory.

CO2 zero adjustment data (F10): 000

CO2 span data (F11) : 100

Note) Service code should not be initialized.

F14: LEDs and drivers performance check

<Direction for use> Input “F14” on temperature display and press ENT key to sound buzzer, flash the indication lamp and the all digits at every 0.5seconds intervals. Press ENT key to stop their actions.

If there is no key operation for approximately 90seconds, automatically comes to the end.

F15: Temperature zero point adjustment value is displayed (initial: 0.8℃)

<Direction for use> Input “F15” on temperature display and press ENT key to display an temperature zero point adjustment value on CO_2 display. Press ENT key or leave it for 90seconds, automatically reverts to PV display.

(Ex.) In “37.0” is displayed on the control panel and actual temperature is “37.8”, if you perform temperature calibration (actual temperature “37.8” is input), “+0.8” would be housed in F15. In Function Mode, input F15 and press ENT key to display the value on CO_2 display.

F21: Serial communication ID setting (initial: 000)

<Direction for use> Input “F21” on temperature display and press ENT key to show “000” on CO_2 display. Then input the value that identifies the product (serial communication ID Number) and press ENT key to set serial communication ID. The settable range is 000~255. (000: communication OFF)

Following data can be communicated:

- Internal temperature (TEMP.PV)
- Internal CO_2 level (CO2.PV)
- UV lamp lighting time
- Ambient temperature sensor temperature (AT.PV)
- Door open information
- Water level in humidifying pan
- Internal temperature setting value (TEMP.PV)
- Internal CO_2 level setting value (CO2..PV)
- UV lamp lighting time setting value (F01)

F22: Serial communication mode setting (initial: 000)
<Direction for use> Input "F22" on temperature display and press ENT key to show "000" on CO_2 display. Then change the 3rd digit to set the communication mode.

Control mode (the 3rd digit)	0: Local (initial)
	1: Remote
Baud rate (the 2nd digit)	0: 2400bps
	1: 4800bps
	2: 9600bps

F24: Remote alarm interlocks with buzzer (initial: 000)
<Direction for use> Input "F24" on temperature display and press ENT key to show "000/001" on CO_2 display. Then change the 1st digit to be interlocking mode available.
000: Remote alarm does not interlock with buzzer
001: Remote alarm interlocks with buzzer

F25: Ring Back time set (initial: 030 (30min), settable range: 0~60min)
<Direction for use> Input "F25" on temperature display and press ENT key to set current Ring Back delay time. Change the 2nd digit to set delay time.
Note) If Ring Back time is set in "000", buzzer does not recover.

F30: Display a ROM version
<Direction for use> Input "F30" on temperature display and press ENT key to show current ROM version on CO_2 display.

11. Bottom heater control

In order to shorten the humidity recovery time, conduct electricity to humidity heater as follows.

- In the ordinary, the maximum conducting electricity to bottom heater should be 80%.
- When the internal temperature is SV－0.4~－0.6℃, 80% electricity is conducted to humidifying heater for maximum 10minutes. When the internal temperature is except for SV －0.4~－0.6℃, the electricity set in F06 is conducted.
- It should not be conducted in 80% electricity in the following cases:
  1) The period until an internal temperature reaches to SV-0.2℃ after the power is supplied
  2) The period until an internal temperature reaches to SV-0.2℃ after the door is opened for 60seconds or more.

12. Door heater control

Ordinarily, door heater is electrifying in the same ratio with main heater. SV in F07 is applied.

13. Remote alarm: remote alarm contact

In normal condition …….. Open
In alarming condition …… Close
Note) The recovery time after BZ key is pressed and linkage between remote alarm and buzzer are depending on F24, F25 setting.

14. Ring back

When the apparatus falls into alarming, BZ key should not be pressed by someone to be buzzer/remote alarm action inoperative.

Function:

1. Buzzer comes back after Ring Back setting time was passed even if buzzer is stopped sounding by pressing BZ key.
2. Remote alarm action is not cancelled by pressing BZ key.
3. Alarm indication on the control panel is keep displaying.

<Alarm operation specification>

Status	Auto-recovery 30min. (F25=030)	Auto-recovery inoperative (F25=000)
Alarming	● Press BZ key to solely stop buzzer sounding. ● Remote alarm and alarm on the control panel keeps activating.	
When recovery to normal	● Alarm stand-by ● When alarm comes back again, buzzer and remote alarm are operative, alarm can be displayed on the control panel.	
When alarm keeps activating after the setting time has passed	Buzzer recovers after 30minutes passed since BZ key was pressed.	Buzzer does not sound unless alarm keeps activating even though BZ key is pressed. Remote alarm and alarm on control panel are keep activating.

<SV and buzzer recovery time>

SV	Buzzer recovery time after buzzer is stopped sounding by pressing BZ key.
000	Buzzer does not sound
010	Approx. 10min.
020	Approx. 20min.
030	Approx. 30min.
040	Approx. 40min.
050	Approx. 50min.
060	Approx. 60min.

<Special mode>

Remote alarm action is interlocked with buzzer by function code setting.

The function code must not be opened to prevent remote alarm action changed easily.

		Remote alarm action setting	
		Buzzer independent (initial setting) (F24=000)	Buzzer interlocked (F24=001)
Buzzer setting	Auto recovery (F25=030)	Buzzer auto recovered Remote alarm keeps activating	Buzzer auto recovered Remote alarm auto recovered
	Not auto recovered (F25=000)	Buzzer is not auto recovered Remote alarm keeps activating	Buzzer is not auto recovered Remote alarm is not auto recovered

SV	Remote alarm action
000 (initial setting)	Not interlocked with buzzer
001	Interlocked with buzzer

15. Storing in non-volatile memory

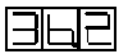
2 times comparison method: When the main power is supplied, a data storing in non-volatile memory is called for 2 times to compare. If the data 1st called coincides with the data of 2nd called, the data would be stored in RAM. Otherwise, the comparison would be repeated until the one coincides with another.

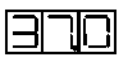
16. Temperature offset value

The difference between temperature sensed in temperature control sensor and temperature in internal 1/2H should be offset:

Offset value: +0.8℃

17. Example for displays

Current temperature +36.2℃ 

Set temperature +37.0℃ 

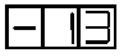
Function F03

(Service code input)

Bottom heater ratio 004

Lock Mode L 0

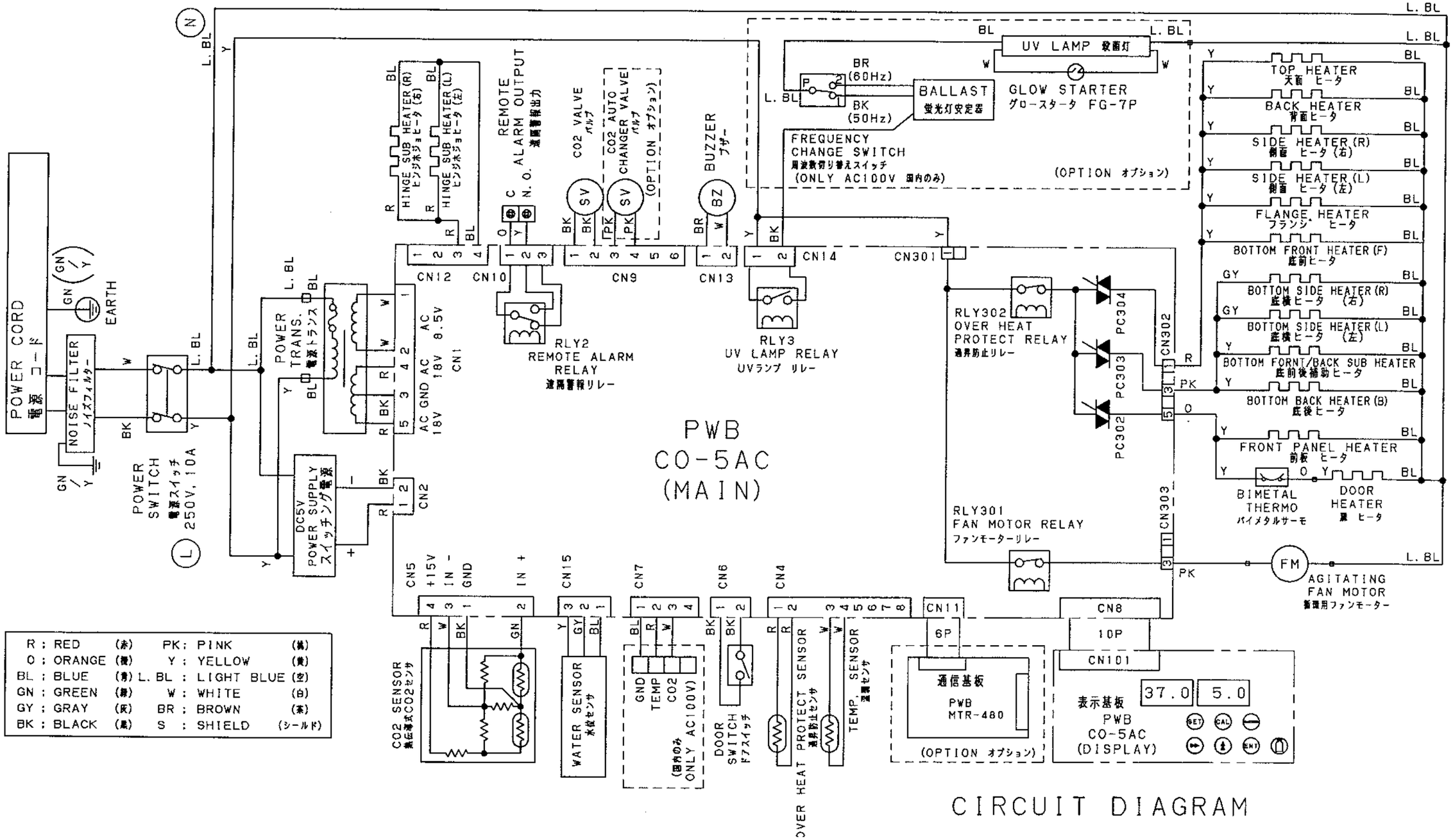
CO_2 level +5.0%

CO_2 level zero adjustment value –1.3% 

CO_2 gas error E01

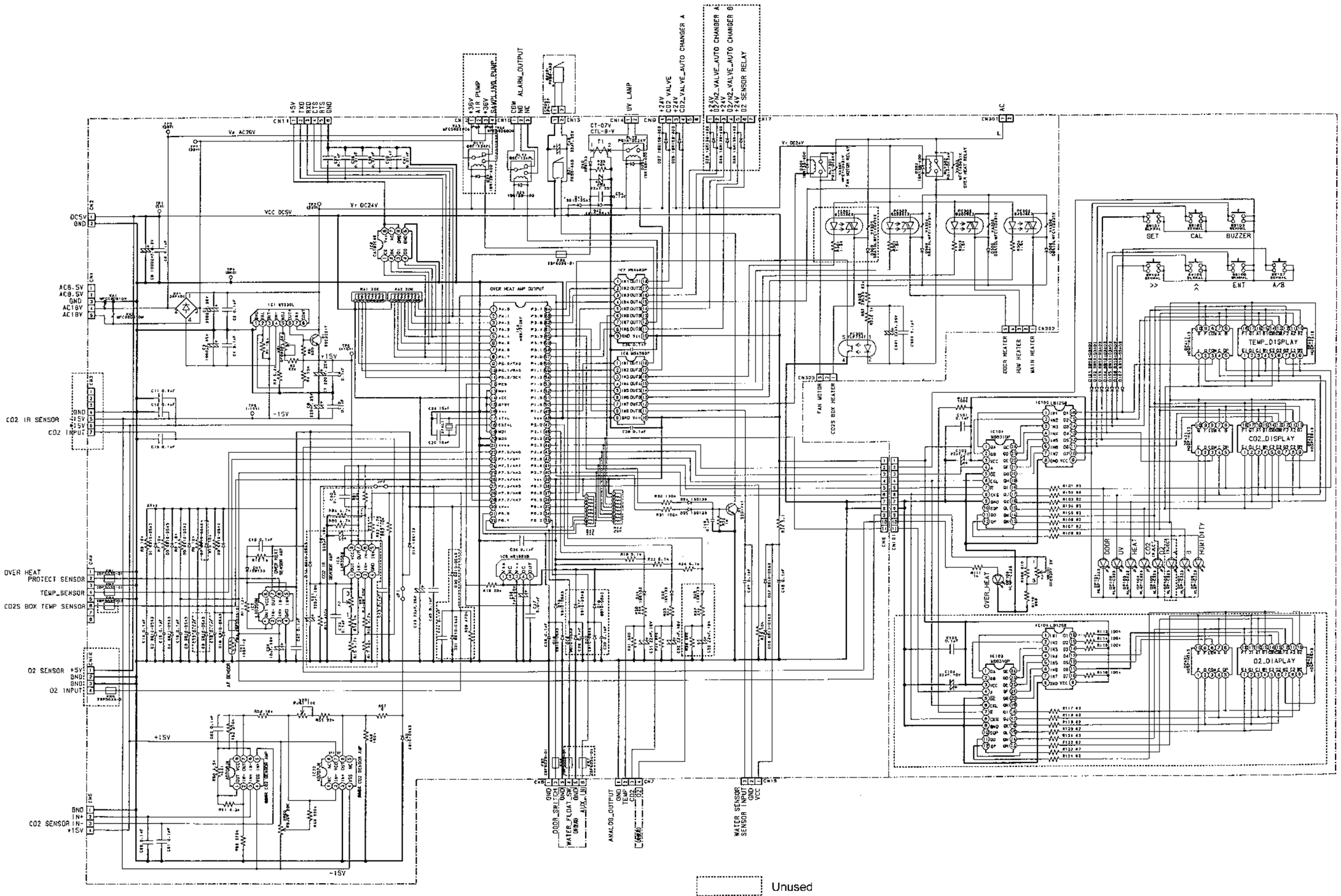
UV lamp additional time

Wiring Diagram

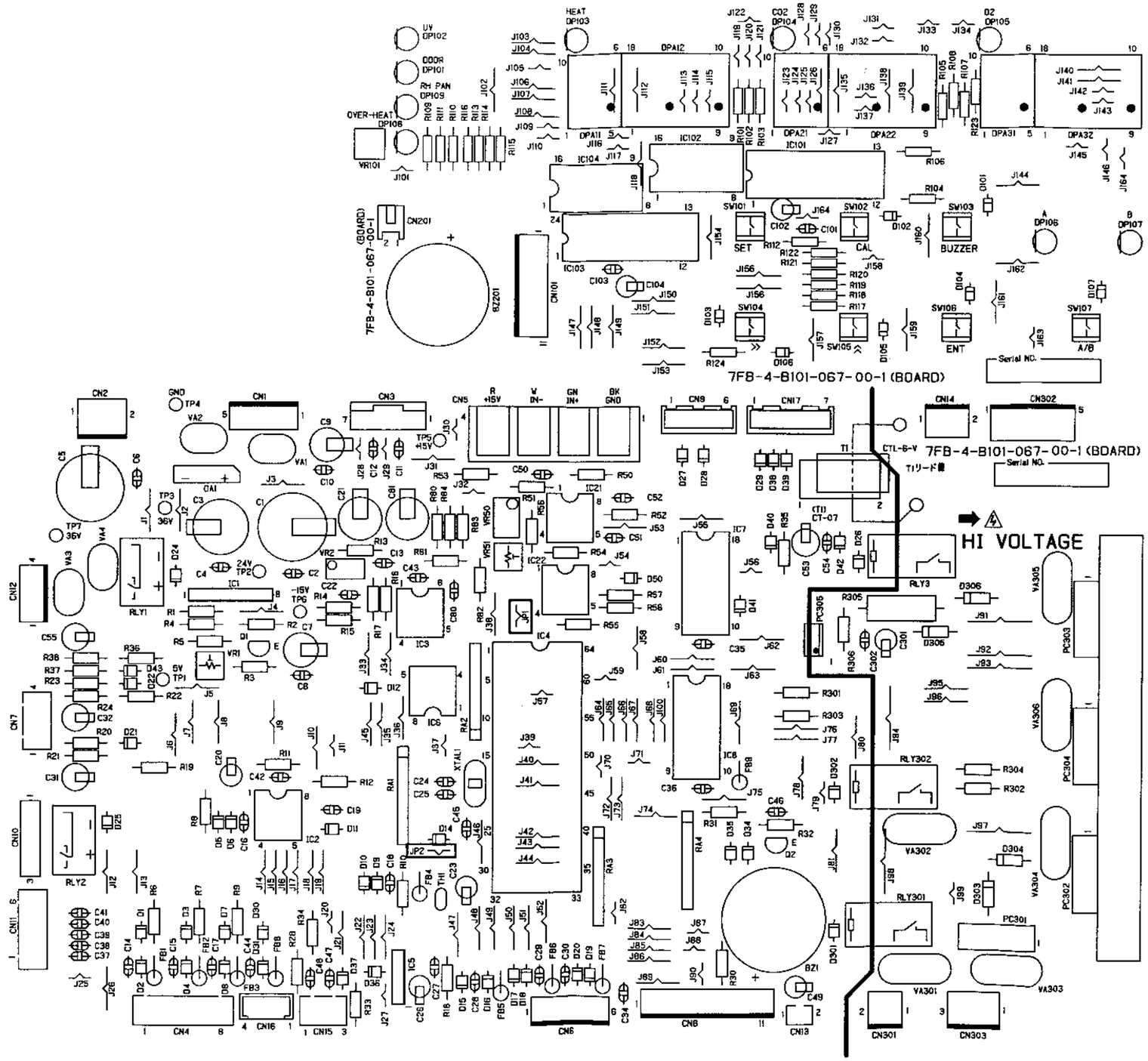


CIRCUIT DIAGRAM

Circuit Diagram



Components on P.C.B.



Connection on PCB

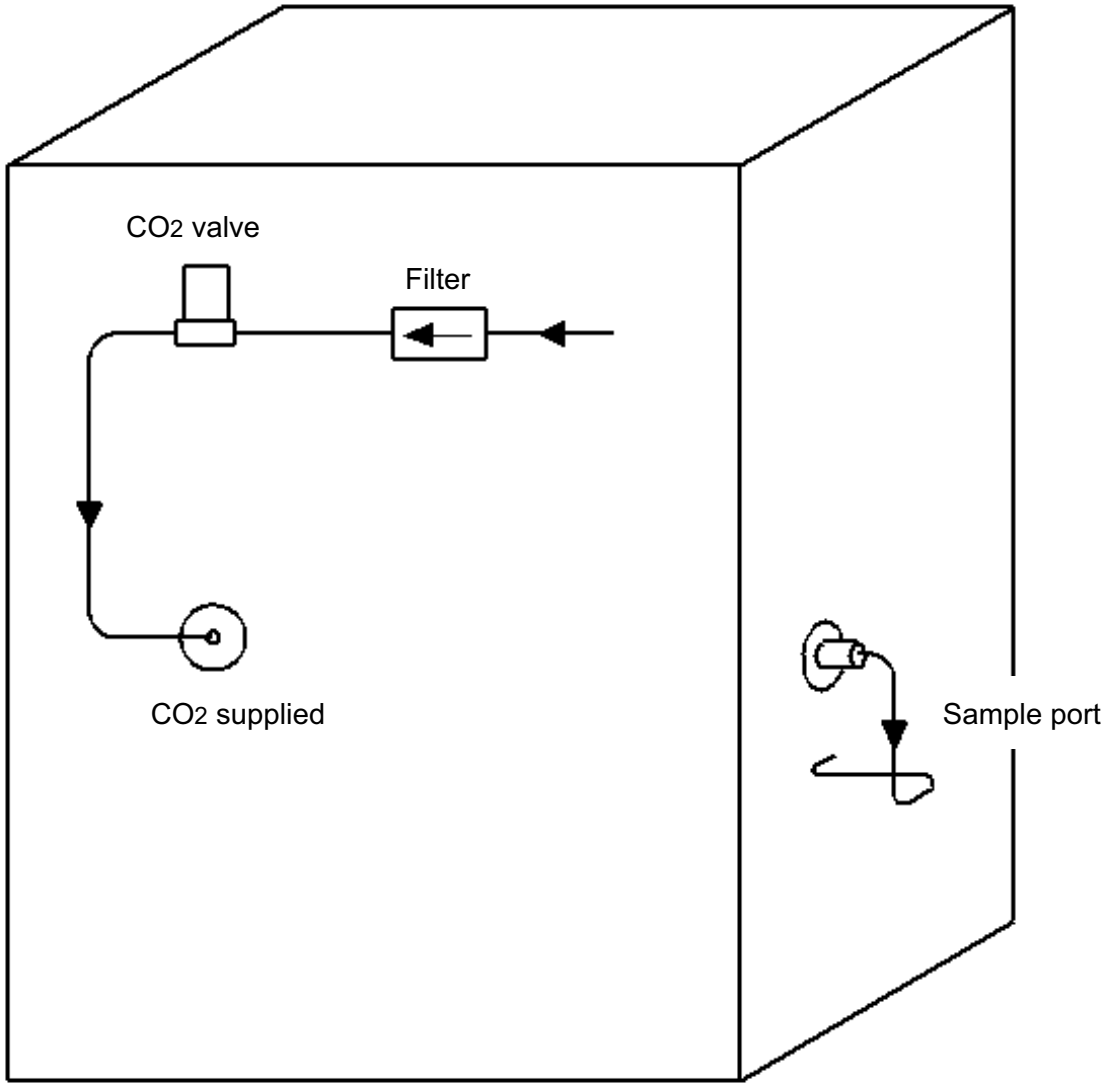
The following shows connections of connector (CN) on main PCB.

Connector	Connects to	Use
CN1	Power transformer Between #1－#2, AC8.5V #3 GND #4 and #5, AC18V	To supply the power to PCB.
CN2	Power supply Between #1－#2（GND）, DC5V	To supply the power to PCB.
CN4	#1－#2 Overheat protect sensor #3－#4 Temperature sensor	To measure the temperature of each parts.
CN5	CO_2 sensor	Input from CO_2 sensor
CN6	Door switch	To detect the door opening.
CN8	Switch, display PCB (CN101)	
CN9	#1－#2 CO_2 valve #3－#4 CO_2 auto changer valve (option)	To control CO_2 valve ON and OFF.
CN10	Remote alarm output #1－#2 Open during normal operation	Output of remote alarm contact
CN11	Communication PCB (option)	
CN12	#3－#4 Hinge sub heater (R), (L)	
CN13	Buzzer	For alarm
CN14	UV lamp relay (option)	
CN15	Water sensor	To check water level in humidifying pan.
CN101	Display PCB (CN8)	

The following shows connections of connector (CN) on power PCB.

Connector	Connects to	Use
CN301	Main PCB	
CN302	#1: Heater for heat control (6pcs) #3: Bottom heater (3pcs) # 5: Front panel heater, Door heater (2pcs)	To control heater
C303	#3: Agitating fan motor	To control agitating fan motor.

CO_2 gas circuit



Rear view

Instructions on replacing CO_2 sensor and main P.C.B

When CO_2 sensor and/or main P.C.B. have been changed, temperature calibration, CO_2 calibration and CO_2 sensor zero adjustment should be done as following procedures.

Recommended write down SV for F06, F07 and F08 prior to replacing main P.C.B. After main P.C.B. replaced, be sure to input each SV.

1. Call F03 and input "384".
   (1) Press CAL key for approx. 5 seconds or more and call "F03" with ⏫ key and ⏩ key. Then press ENT key.
   (2) Input "384" and press ENT key.

2. Pour distilled water in humidifying pan and run the apparatus in SV 37℃.
   (1) Leave it for approx. 10hours* and make sure internal humidity should be equal or higher than 90%.
   * Note) In case internal humidity is not checked, required humidity will be obtained for approx. 5hours operation
   (2) CO_2 should be set in 0%.
   (3) Make sure no condensation in the chamber. If any condensation left in the chamber, reduce the numerical value in F06. If any condensation left in the inner door, add the numerical value in F07.
   (4) Measure the internal temperature with Standard Thermometer (unit: 0.1℃) or PT100Ω sensor.

3. Check the display temperature and the internal temperature.
   If the internal temperature is not match with SV, temperature calibration should be done as follow;
   Method : Input the internal temperature (proper value) on the display.
   Example : When the display temperature is 37.0℃ and the internal temperature is 36.7℃, press CAL key for approx. 5 seconds or more and input "36.7" with ⏫ key and ⏩ key, then press ENT key.

4. CO_2 zero adjustment
   (1) Prior to CO_2 zero adjustment, make sure no CO_2 is left in the chamber.
   CO_2 zero adjustment should be performed before CO_2 is charged.
   When CO_2 zero adjustment is performed again, make sure no CO_2 is left with door open.
   (2) CO_2 zero adjustment procedure
   Press CAL key for approx. 5 seconds or more and press CAL key again.
   With CO_2 display blinks, input "00.0" with ⏫ key and ⏩ key and press ENT key.
   If the CO_2 display is "00.0", just press ENT key to come calibration to end.

5. CO_2 level adjustment
   (1) Set CO_2 in 5% to be CO_2 display stabilize (approx. 30 minutes passed after CO2 charged). Measure CO_2 value in sampling port.
   (2) CO_2 level calibration
   If the measured value is in proper range, input the value to come CO_2 calibration to end. When the measured value is not matched with display value, CO_2 calibration should be done as follow;
   Press CAL key for approx. 5 seconds or more and press CAL key again.
   With CO_2 display blinks, input actual value with ⏫ key and ⏩ key.
   (Ex. When the measured CO_2 value is 4.5%, "4.5" should be input.)

Prevention of contamination

In servicing for CO_2 incubator, it is important to prevent from contamination.

(1) More than 90% of contamination in CO_2 incubator is caused by mold. Mold is a kind of true fungi, it has high increasing power under high temperature and high humidity. Accordingly, it is easy for mold to increase inside CO_2 incubator. Those increased mold eat up culture (mainly animal cell), eventually precious test sample will be killed. Cell that is independent from ecosystem is also independent from immune system, it has no immunity against all.

(2) Precautions for mold increasing

There are many cases that mold multiply by eating fat on the fingers as a source of nutrient in CO_2 incubator.

Therefore,

①Be sure to wash and sterilize your hands prior to servicing. Use 70% ethanol.

②In installing, sterilize the inside wall and shelves after removing shelves, duct, humidifying pan and so on with 70% ethanol.

(3) In the case that mold has already multiplied.

Sterilize the interior (walls) and shelves with 70% ethanol after removed all items from the chamber as same as (2)-② above.

And you should sterilize again after 24 hours once sterilized, when the root of spore is geminated, because it is too difficult to remove spore of mold. Repeat sterilization is effective.

NOTICE

In general, stainless steel is known that it is not easy（hard）to rust.

However depends on the conditions, rust might generate.

When you remove rust, we recommend the following agents.

Besides, the surface may become foggy.

Recommended agent:

1. Cream cleanser「Gif」（Nippon Leva）
2. Picasso #SUS300-W（Chemical YAMAMOTO）

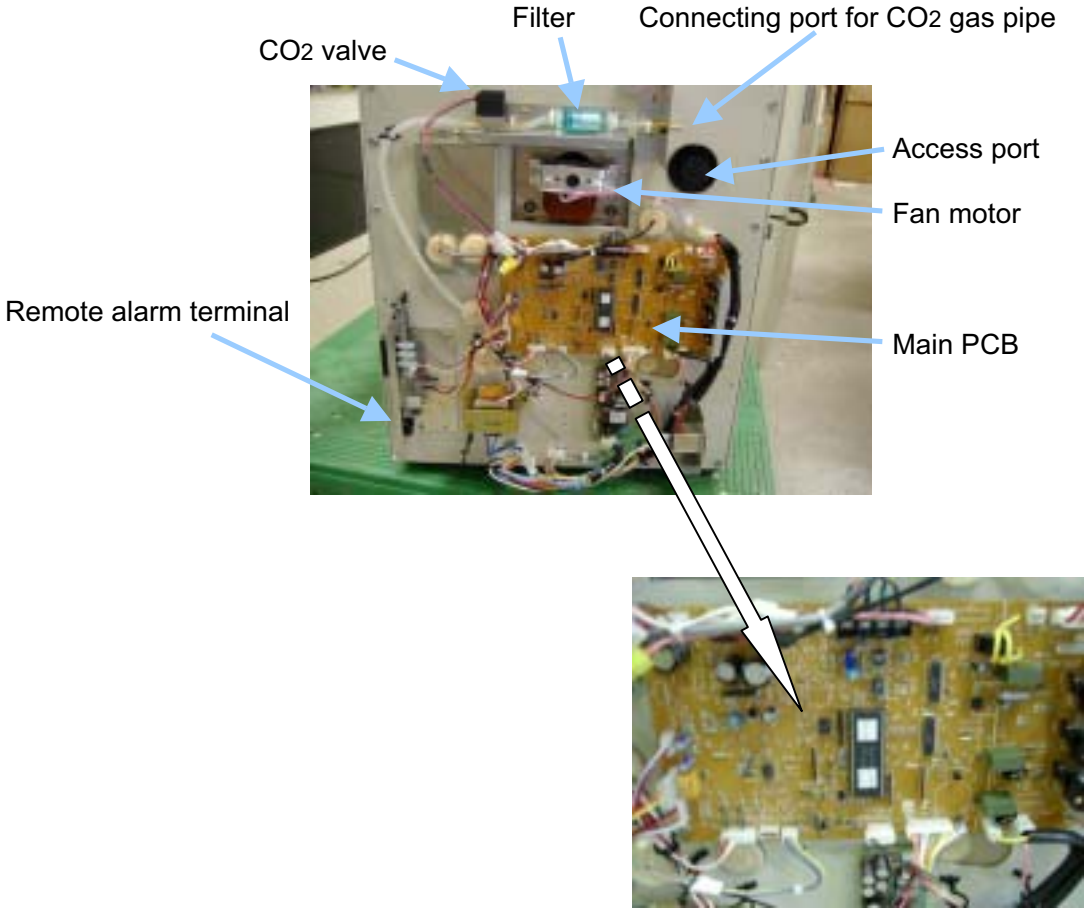
＜Picasso has greater capability of clean for rust than Gif.＞

Specifications of sensor

■ Temperature/Resistance for temperature sensor 103AT-1
The measure of internal temperature (internal temperature, overheat protection) and ambient temperature

Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)
0	27.28	17	13.57	34	7.19
1	26.13	18	13.06	35	6.94
2	25.03	19	12.56	36	6.70
3	23.99	20	12.09	37	6.47
4	22.99	21	11.63	38	6.25
5	22.05	22	11.20	39	6.03
6	21.15	23	10.78	40	5.83
7	20.29	24	10.38	41	5.63
8	19.48	25	10.00	42	5.44
9	18.70	26	9.63	43	5.26
10	17.96	27	9.28	44	5.08
11	17.24	28	8.94	45	4.91
12	16.55	29	8.62	46	4.75
13	15.90	30	8.31	47	4.59
14	15.28	31	8.02	48	4.44
15	14.68	32	7.73	49	4.30
16	14.12	33	7.46	50	4.16

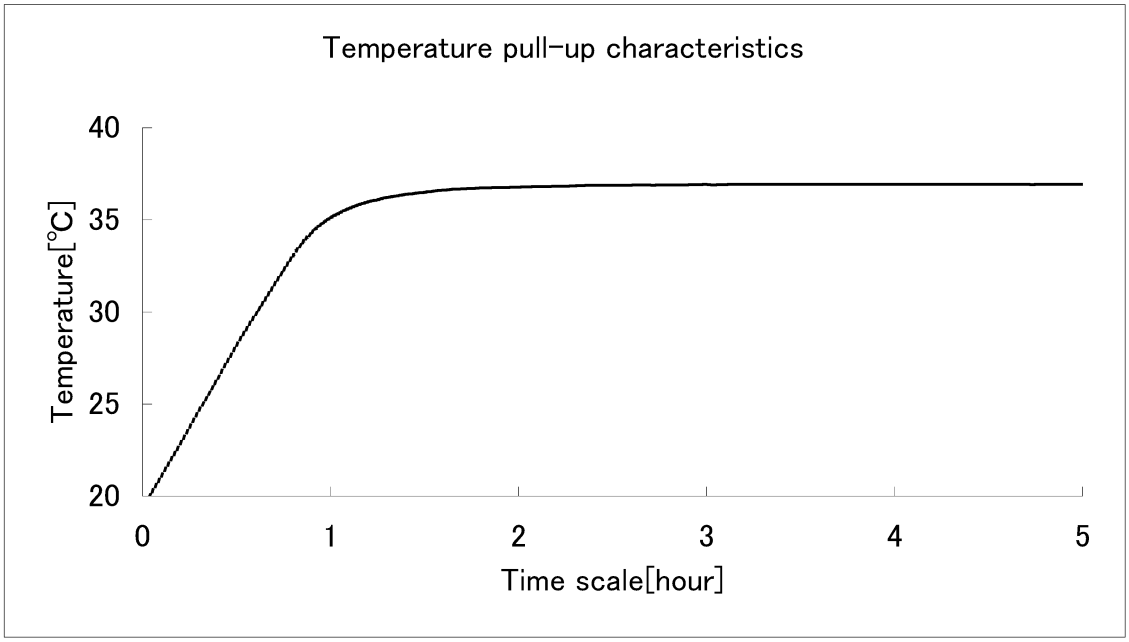
Parts Layout

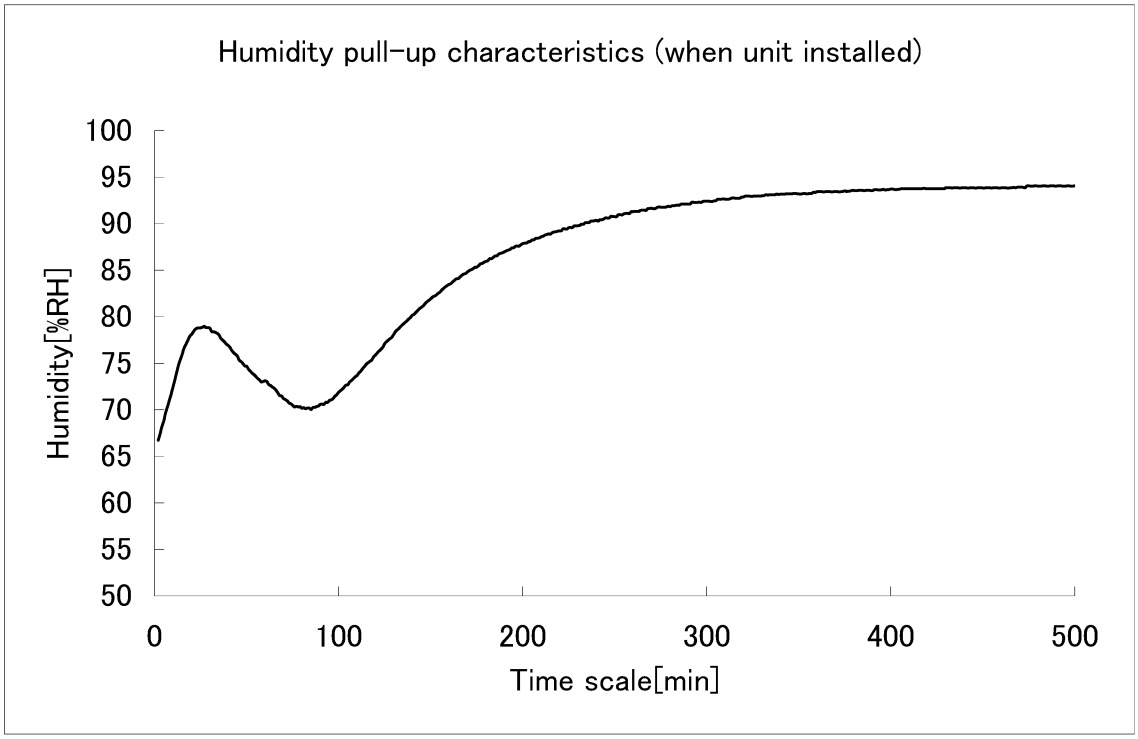

Filter
Connecting port for CO2 gas pipe
CO2 valve
Access port
Fan motor
Remote alarm terminal
Main PCB

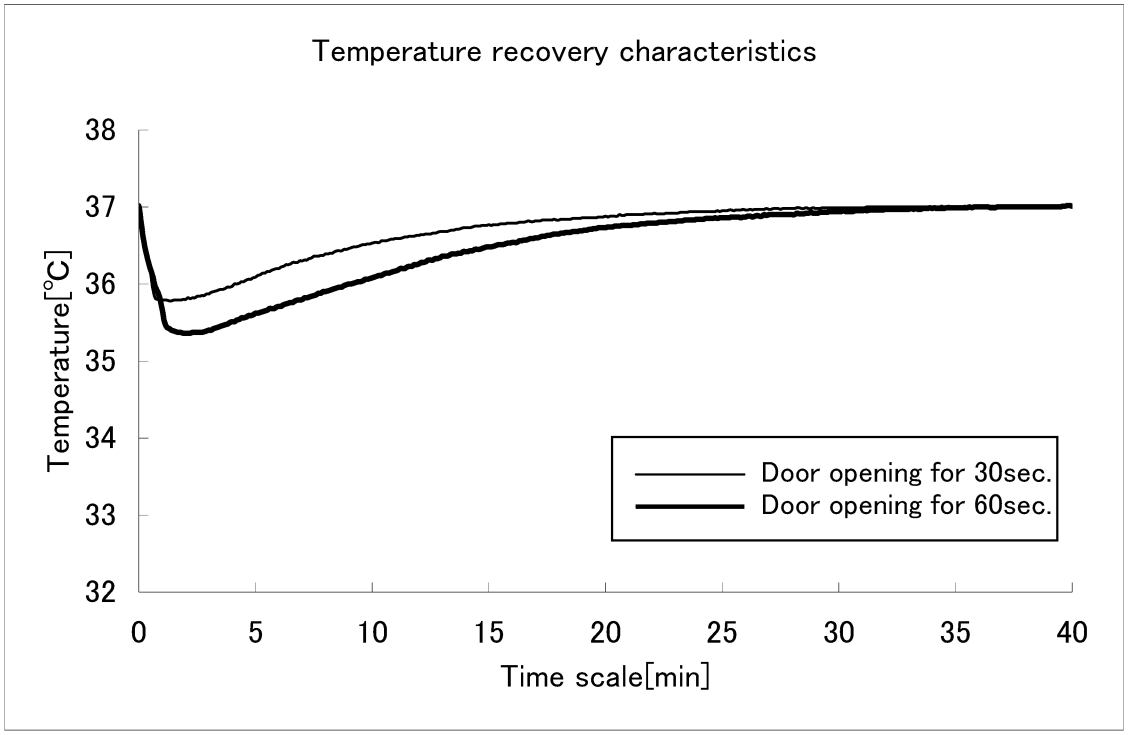
Test data

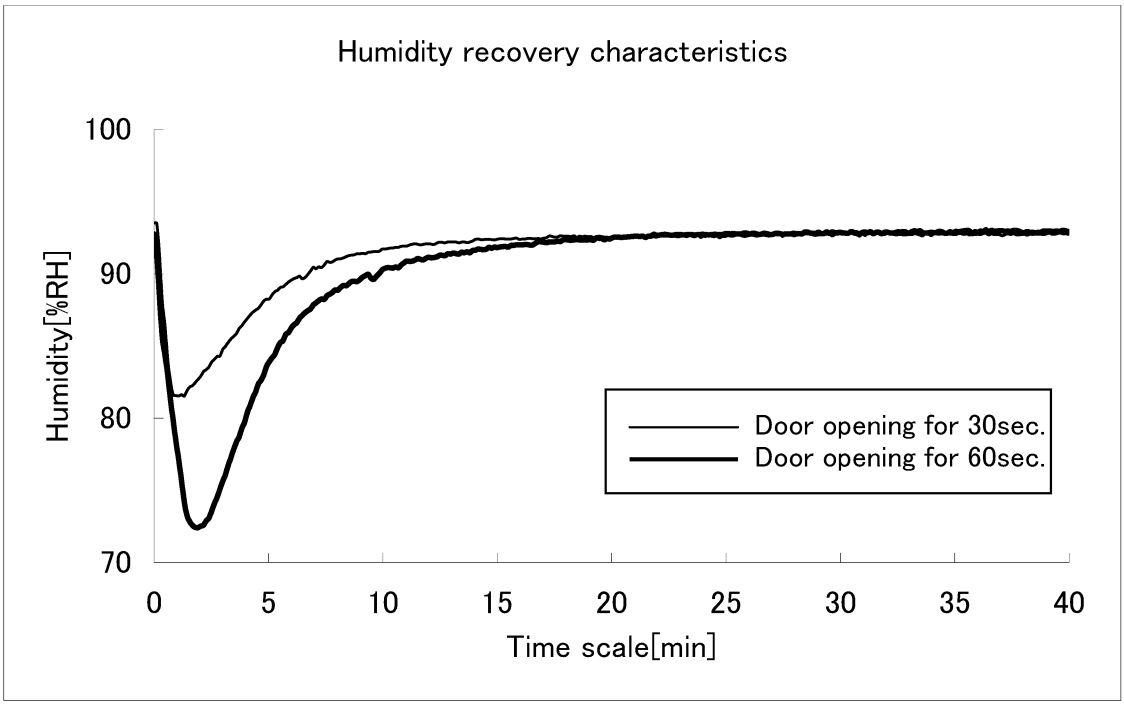
<Test condition>
*Ambient temperature: 20℃
*Internnal temperature: 37.0℃
*Internal CO2 density setting: 5.0%
*No load

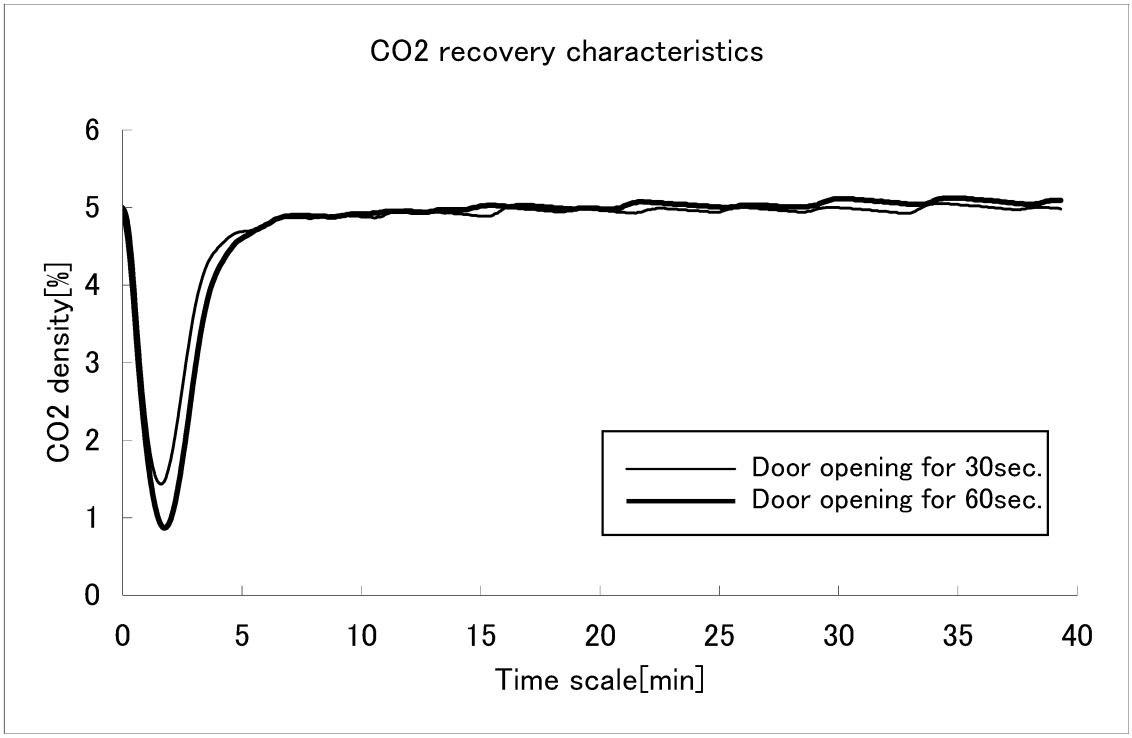
<u>Following data do not represent a guarantee of product performance.</u>

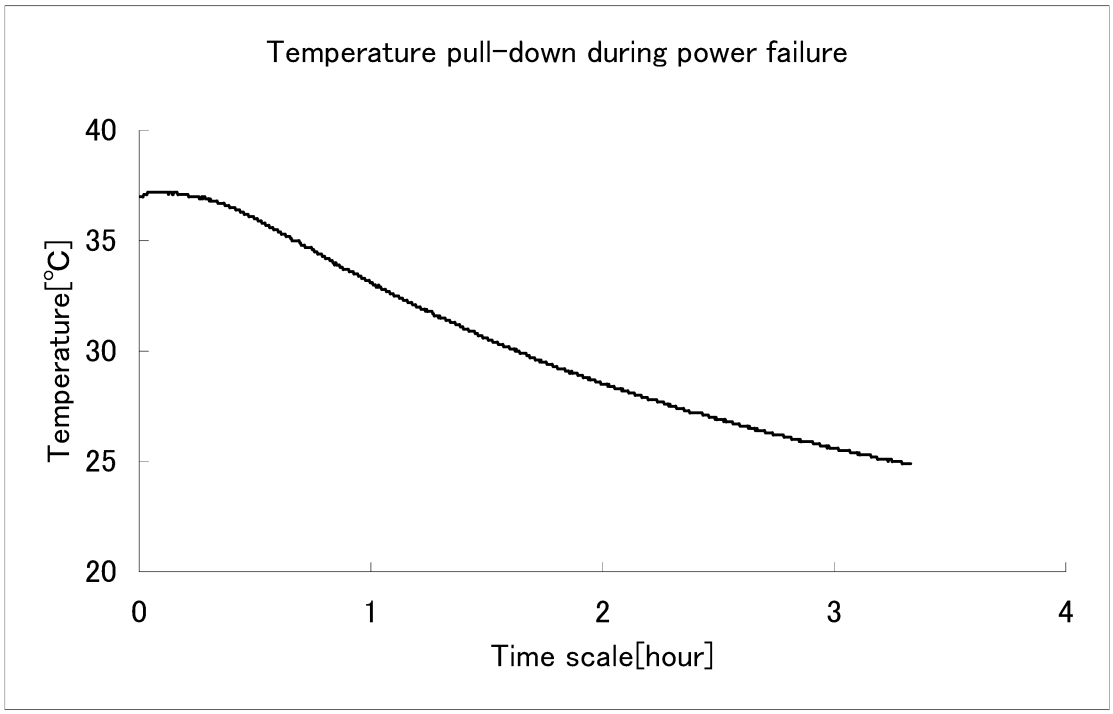


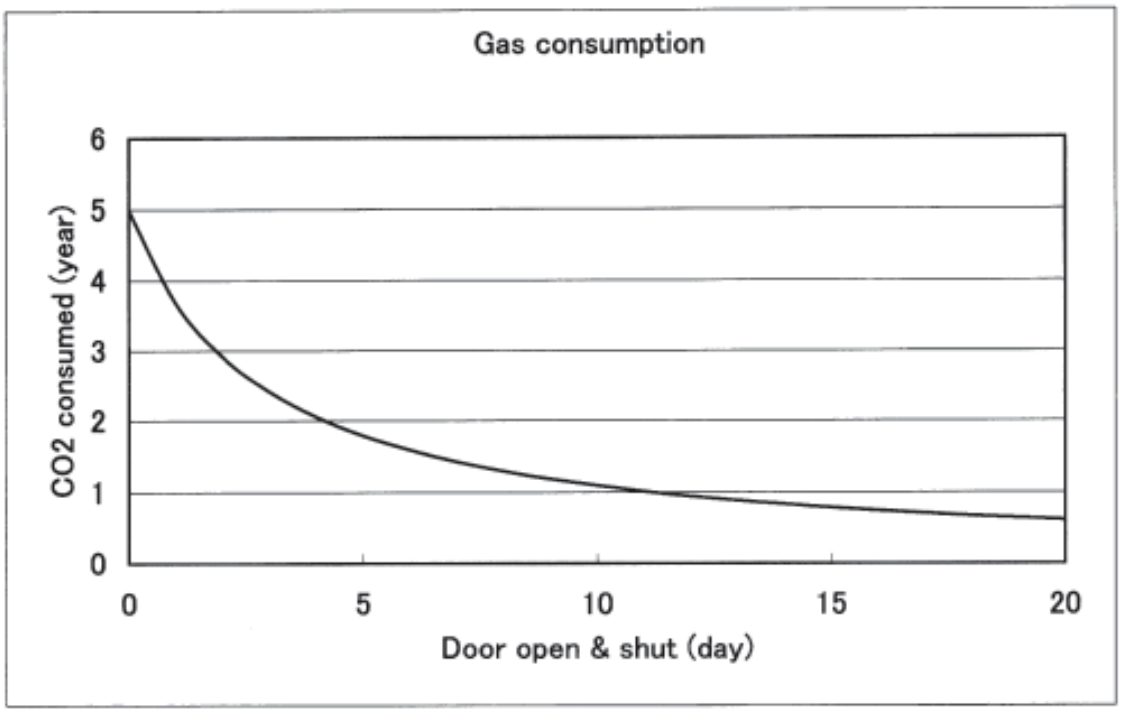



Temperature recovery characteristics
38
37
36
35
34
33
32
Temperature[℃]
0
5
10
15
20
25
30
35
40
Time scale[min]
Door opening for 30sec.
Door opening for 60sec.


Humidity recovery characteristics
100
90
80
70
Humidity[%RH]
0
5
10
15
20
25
30
35
40
Time scale[min]
Door opening for 30sec.
Door opening for 60sec.


CO2 recovery characteristics
CO2 density[%]
Time scale[min]
Door opening for 30sec.
Door opening for 60sec.
0
1
2
3
4
5
6
0
5
10
15
20
25
30
35
40


Temperature pull-down during power failure
Temperature[°C]
Time scale[hour]
20
25
30
35
40
0
1
2
3
4



<Test condition>

① AT : 37℃

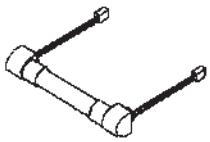
② CO_2 setting : 5%

③ Volume : 30kg

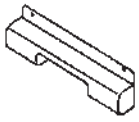
* Above data is the reference only.

MCO-18UVS2 Installation Procedure

Kit of MCO-18UVS2

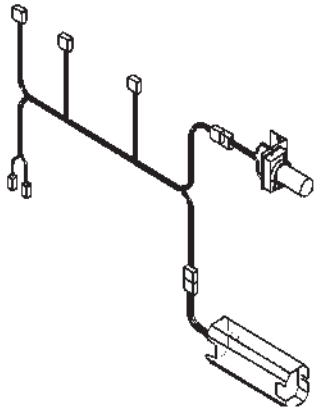


① 1 UV lamp



② 1 UV lamp cover

③ 6 screws（M4）



④ 1 ballast & glow assy

⑤ 1 UV label

⑥ 1 UV caution label

⑦ 1 UV door switch caution label

⑧ 2 Name plate

⑨ 1 Patent label

Procedure

1. Unplug the unit and make sure that power is not supplied to the unit.

2. Remove the duct from inside the unit, then take off 2 caps and 2 screws shown in Fig. 1.

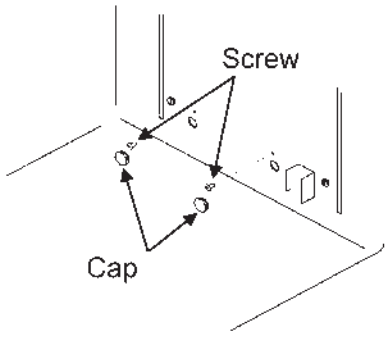


Fig.1

3. Take off the rear cover shown in Fig. 2.

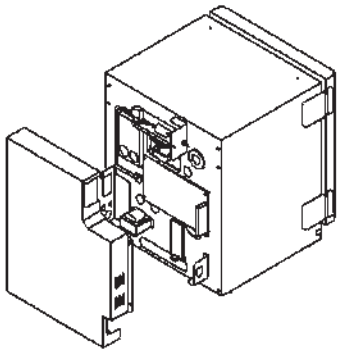


Fig.2

4. Take out two insulations for the UV lamp lead wire hole shown in Fig. 3.
   The insulation can be taken out easily by pushing it from inside of the chamber. Keep the insulation for the future use again.

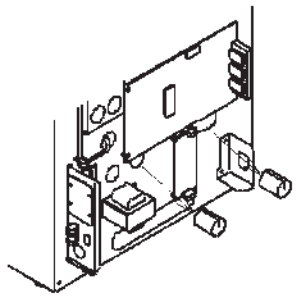


Fig.3

5. Set the UV lamp to the hole and make sure to be fitted properly.
   Fix the UV lamp cover with 2 screws enclosed in this kit.

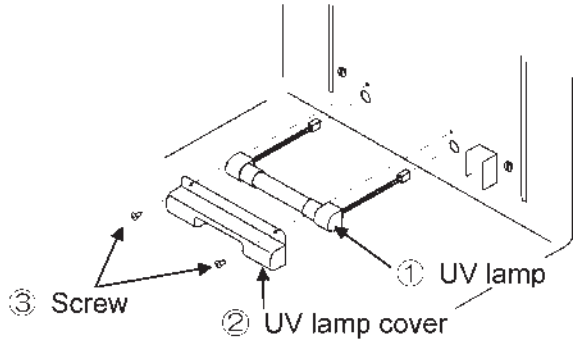


Fig.4

6. Replace the duct. Place the humidifying tray, then cover the tray with the humidifying tray cover as shown in Fig. 5

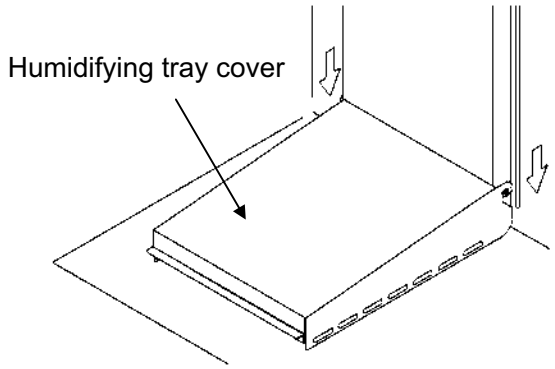


Fig.5

7. Replace the insulation into the UV lamp lead wire hole with the wire passed through the cut on the insulation. See Fig.6

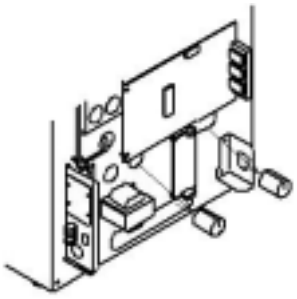


Fig.6

8. Remove a cap shown in Fig. 7.
By using 4 screws enclosed with this kit, fix the ballast/glow assy as shown in Fig. 7.

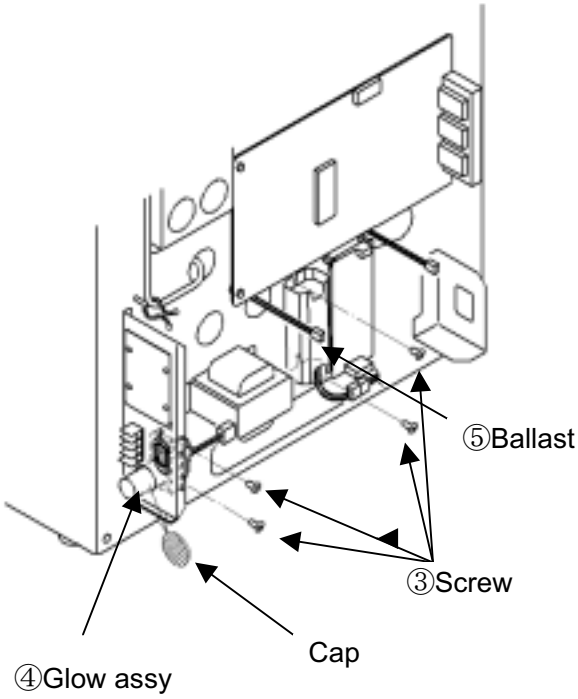


Fig.7

9. Connect each lead wire connector of ballast/glow assy, as shown in Fig. 8.

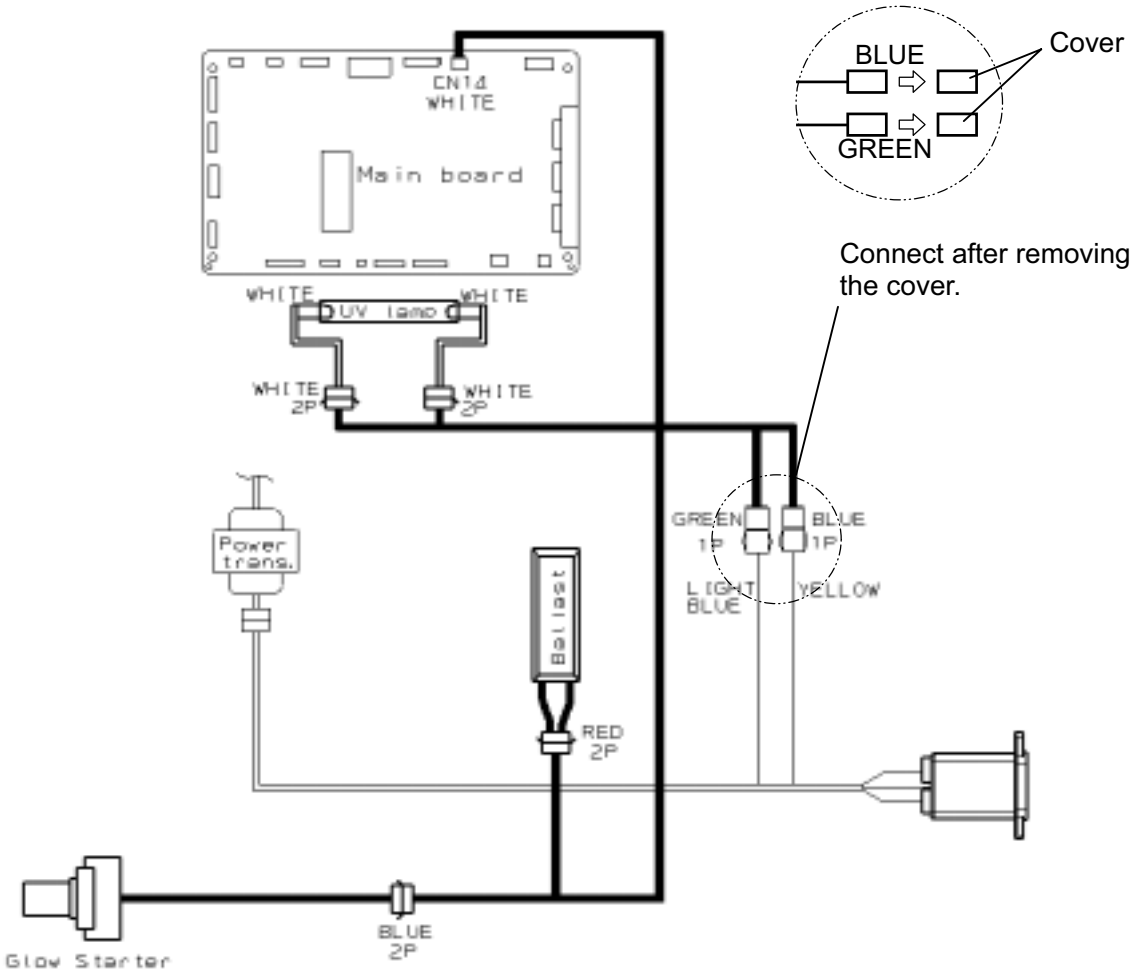


Fig.8

10. Attach the labels.

* For nameplate, use MCO-5AC(UV) label on MCO-5AC.

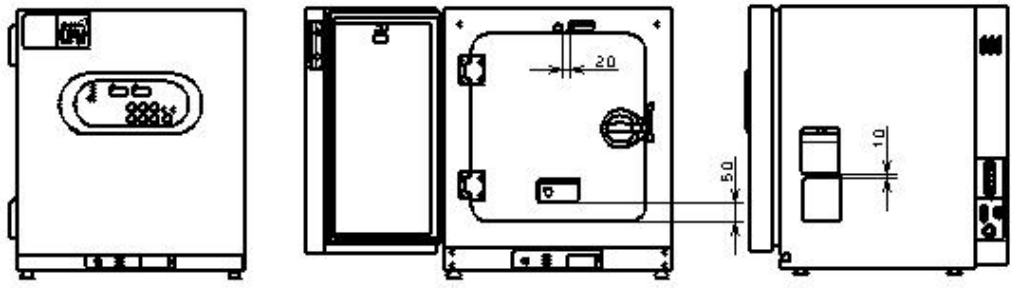


Fig.9

11. Set the UV lamp ON period through control panel

When using UV lamp option, it is needed to set the UV lamp ON period. Refer to the following procedure.

	Description of operation	Key operated	Indication after operation
1	Turn the power switch ON.	-	The current chamber temperature is displayed.
2	Press CAL key for 5 seconds.	CAL	The left digit in the temperature indicator is flashed.
3	By pressing ▶▶ key and ▲▲ key, set the figure to F01.	▶▶ ▲▲	F 0 1
4	Press ENT key.	ENT	In CO_2 density indicator, "000" is displayed and the right digit is flashed. F 0 1 0 0 0
5	By pressing ▶▶ key and ▲▲ key, set the figure to 005 (5 minutes of ON period).	▶▶ ▲▲	F 0 1 0 0 5
6	Press ENT key.	ENT	The setting of UV lamp ON time is memorized and the current chamber temperature is displayed.

<<NOTE>>

- The UV lamp ON time is settable between 0 to 30 minutes. However, it is recommended to set 5 minutes in general.
- The UV lamp ON time is settable between 0 to 30 minutes (000 to 030). The UV lamp is not turned ON if the setting is 000.
- The UV lamp is turned off when the outer door is opened while the lamp is on. The lamp is turned on for pre-set duration after the outer door is closed.
- The condensation in the chamber can be caused and/or the chamber temperature distribution can be affected due to the heat from UV lamp when the setting of UV lamp ON time is longer than 5 minutes or the only the outer door is opened/closed repeatedly. In such case, the life of UV lamp is shortened.
- In the procedure 2 above, pressing CAL key for 5 seconds causes the calibration mode. In this mode, it is possible to calibrate the temperature and CO_2 density, and miss operation of the key may affect the basic performance of the unit. Take care of the key operation. Even if the key is operated wrongly, the unit returns to the current value display mode automatically when no key is operated for 90 seconds. In this case, the setting not entered by pressing ENT key is not effective.

12. Check that the UV lamp is turned on.

Check the UV lamp is turned on by the following procedure:

	Procedure
1	Open the outer door and push the door switch with the inner door is closed.
2	Check that the UV indicator on the control panel is on after a few seconds.
3	Check the visible blue light from the front side of the humidifying pan cover. (Check the light with the inner door closed. Never look at the UV light directly.)

HOW TO REPLACE WATER LEVEL SENSOR

1.Unplug the unit and check that power is not supplied to the unit, then take the rear cover off.

2.Unfasten the connectors for lead wire and take out the insulation for the lead wire hole.

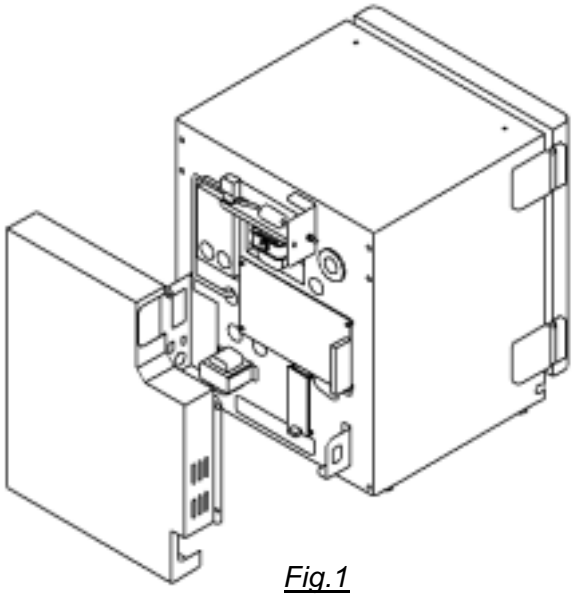


Fig.1

3.Take out the duct from inside.

4.Unfasten the 2 screws to remove unit of water level sensor and installation grommets for water level sensor.

5.replace water level sensor.

Note Be sure to set the water level sensor to the right direction. (See Fig.3)

6.Place back the water level sensor, Water sensor installation grommet as before.

7.Place back the insulation material to the hole for the lead wire.

Note Be careful for the length of lead wire for water level sensor inside the unit Length is connect 2nd binder is located where it touches the water level sensor grommet.

(See Fig.4)

3.Put the rear cover in place.

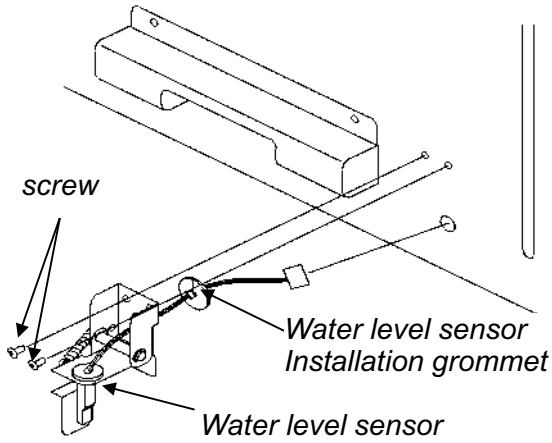


Fig.2

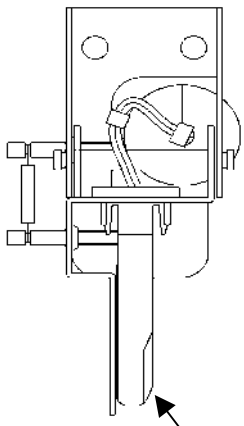


Fig.3 (front)

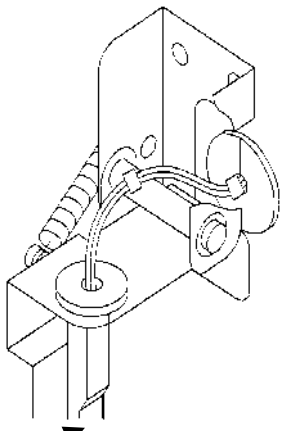


Fig.4

Sensing area

Mounting Procedure of MCO-5GC

(Automatic gas switcher for MCO-5AC)

Parts list

① CO_2 valve B assy

② y-pipe assy

③ connecting port for CO_2 gas pipe

④ nut

⑤ spring washer

⑥ tube band (L)

⑦ tube band (S)

⑧ screw

⑨ tube

Mounting procedure

1.Disconnect the power cable and make sure that the unit is not supplied with the power.
2.Remove the rear cover by unscrewing the 5 fixing screws.
3.Fix ① by using the enclosed screws(⑧).
4.Remove cap and fix ③ with ④ and ⑤.
5.Connect the wiring harness of CO_2 valve B to yellow connector of wiring harness from CN9 on Main board.
6.Disconnect left tube of CO_2 valve A.
Connect CO_2 valve A and CO_2 valve B and tube X by using ② as shown in Fig. 3 .
7.Connect right tube of ① to ③.
8.Connect ③ with CO_2 gas supply line B by using ⑨.
9 .Fix tubes securely using ⑥ and ⑦ as shown in Fig. 3 .
10.Replace the rear cover.

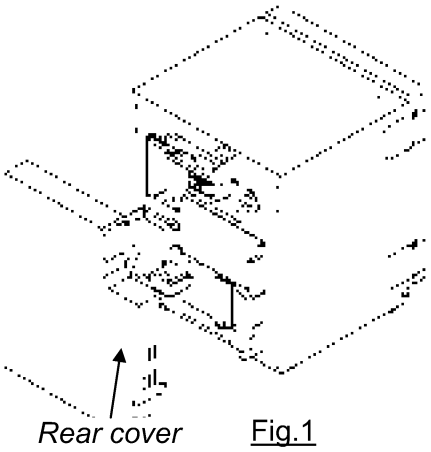


Fig.1

NOTE: Every tubes should be connected surely to prevent CO_2 leakage.

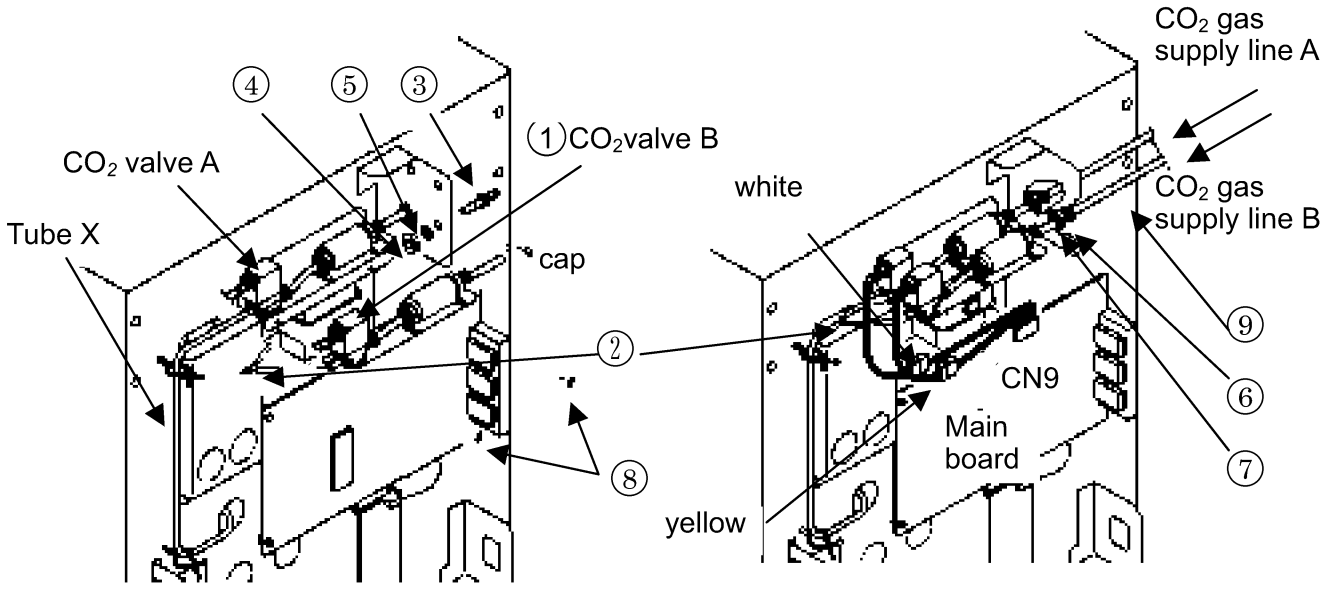


Fig 2

Fig 3

Setting procedure of Control panel.

When use MCO-5GC(the automatic switcher of CO_2 gas supply line),it is necessary to set the MCO-5AC automatic gas switching mode according to the following procedures.

	Description of operation	Key operated	Indication after operation
1	Turn the power switch ON.	-	The current chamber temperature is displayed.
2	Press CAL key for 5 seconds.	CAL	The left digit in the temperature indicator is flashed.
3	By pressing ▶▶ key and ▲ key, set the figure to F03.	▶▶ ▲	F 0 3
4	Press ENT key.	ENT	In CO_2 density indicator, "000" is displayed and the right digit is flashed. F 0 3 0 0 0
5	By pressing ▶▶ key and ▲ key, set the figure to 384	▶▶ ▲	F 0 3 3 8 4
6	Press ENT key.	ENT	The current chamber temperature is displayed.
7	Press CAL key for 5 seconds.	CAL	The left digit in the temperature indicator is flashed.
8	By pressing ▶▶ key and ▲ key, set the figure to F08	▶▶ ▲	F 0 8
9	Press ENT key.	ENT	In CO_2 density indicator, "0**" is displayed and the right digit is flashed. F 0 8 0 * *
10	By pressing ▶▶ key and ▲ key, set only the left digit figure to 1. NOTE:Don't change center digit figure and right digit figure.	▶▶ ▲	F 0 8 1 * * "＊" means "0" or "1".
11	Press ENT key.	ENT	Setting of MCO-5GC is finished. The current chamber temperature is displayed. CO_2 gas supply line indicator A is lighted.

Procedure for automatic gas switching operation check.

When the installation of MCO-５GC is completed, check the automatic gas switching operation according to the following to the following procedures.

	procedure
1	Stop the gas supply of cylinder A and use cylinder B only for CO_2 gas supply.
2	Turn on the power switch of MCO-５AC and set 37decC and 0%. Turn on CO_2 gas supply line indicator with CO_2 gas supply line switching key.
3	Wait for approx.1 minute until CO_2 control is available. (It takes about 1 minute until CO_2 control is effective after power ON.)
4	Set the CO_2 density to 5% and check CO_2 inject lamp lights. NOTE: CO_2 inject lamp may not light depending on the temperature, humidity or CO_2 density in the chamber. In this case, set the CO_2 density 1% or more higher than the displayed value.
5	Check the E01(CO_2 gas cylinder empty alarm) and buzzer turn on about 2-7minutes later from the CO_2 inject lamp's turning on.
6	Check the CO_2 gas density indicator reaches to the set value 5% and keep it stably. NOTE: CO_2 density control is interrupted when automatic calibration of CO_2 sensor is activated and the decimal point of CO_2 density indicator blinks.
7	This is the end of check procedure. Press the buzzer key to disappear “E01” and select the cylinder A with CO_2 gas supply select key. Set the CO_2 density to 0% and open the door to release the CO_2 gas completely. After the chamber temperature and humidity are stable, set the CO_2 density to desired value.

Refer to the MCO-５AC instruction manual for usage of MCO-５GC

Stacked module

This unit can be stacked by using the stacking kit. Following shows the procedure for stacking the unit.
Consult with a Sanyo representative or agent prior to stacking procedure as such work involves dangers.

⚠WARNING
Select a level and sturdy floor having enough strength for installation of stacked module.
Never stack 4 or more units.
Take care not to drop or tip over the unit when stacking as this can cause injury or damage of the unit.

1. Turn off the power switch and disconnect a plug of each unit.

2. The stacking plate A and B are contained in accessories bag.
Note: When stacking the unit, 2 stacking plates A and 2 stacking plates B are necessary.

3. Check that the lower unit is level.

4. Remove two caps at 2 locations on the top front of under unit, and apply the protective sticker enclosed with the unit at each corner on the top of the lower unit to avoid scratches or damage(Fig.A).

5. Fix the stacking plate A at 2 locations on the top front of the lower unit by using 2 screws contained in accessories bag.

6. Remove the front panel on the upper unit by unscrewing the 4 fixing screws and then disconnect the wires and gas tube.

7. Stack the unit so that both units can be aligned straight. Also check the upper unit is level. If it is not level, keep the unit even by adjusting the leveling legs.

8. Secure the upper unit with the stacking plate A and 2 screws contained in accessories bag.

9. Remove 2 screws on the above right and left on the rear side of the lower unit.

10. Remove 1 screw on the bottom right and left on the rear side of the upper unit.

11. Fix the stacking plate B at the right and left on the rear of the lower and upper unit with 3 screws removed in step 9 and 10.

12. Replace the front panel on the upper unit after connecting the wires and gas tube.

13. Repeat procedures from step 3. when stake more.

14. Fix the stacked unit to the wall with 2 stacking plate B on the rear of the top unit and rope or chain.

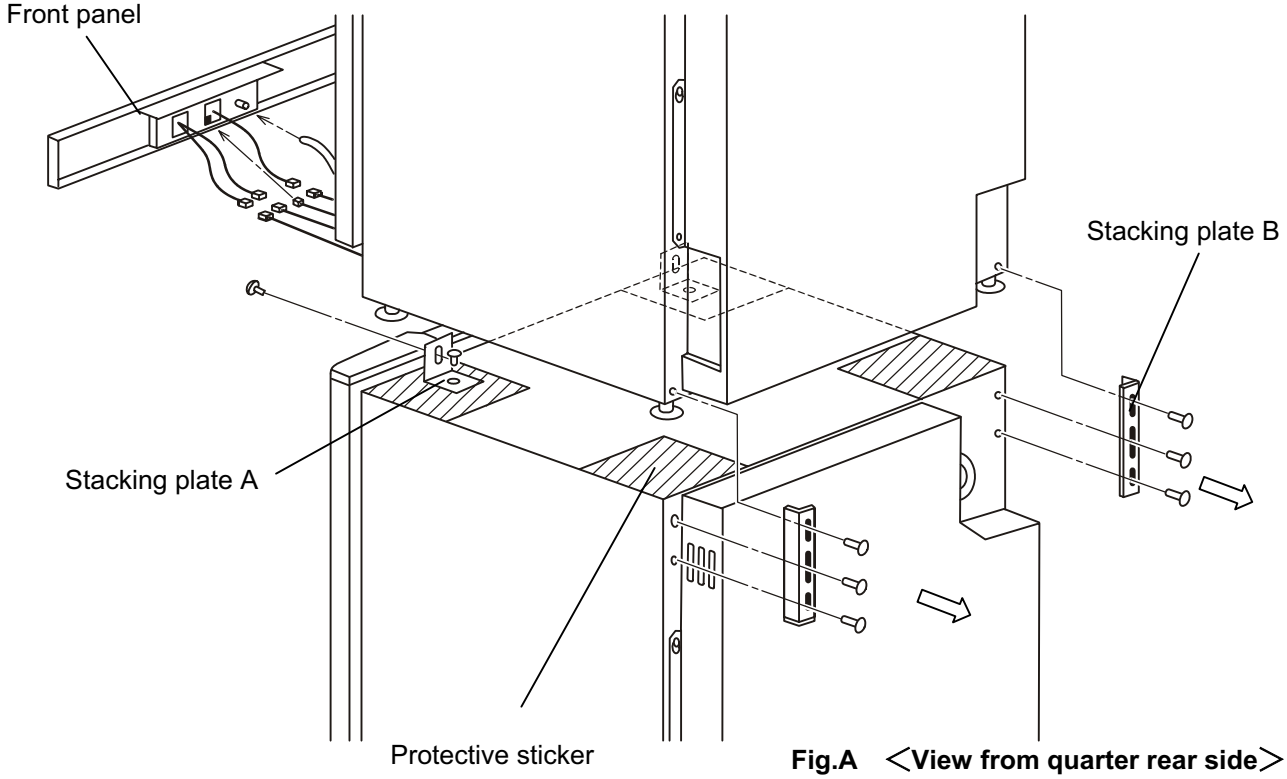


Fig.A ＜View from quarter rear side＞